

MV electrical network management

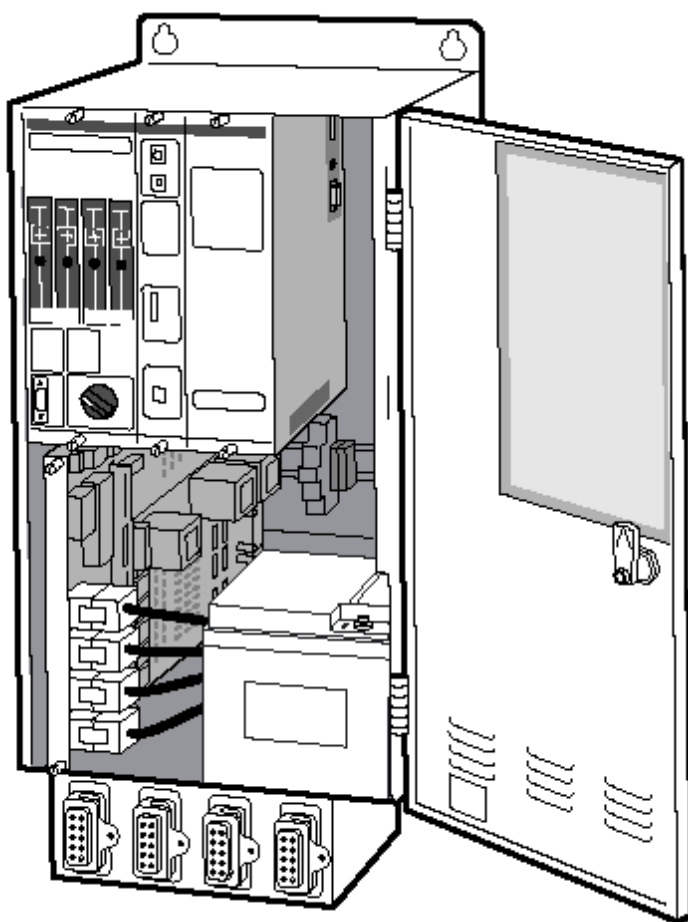
Easergy range

T200 I



MV substation control unit

User's manual



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1 General description

1.1 Functional description

Easergy T200 I is designed to be installed in MV network substations. It contains all the functions required to monitor and control the motorized cubicles:

Management of MV switch opening/closing electric control unit

is triggered by REMOTE CONTROL from the remote control station, by a LOCAL operator command (pushbutton) or by internal AUTOMATIC CONTROLS. Phase-to-phase or phase-to-earth **fault current detection**.

Measurement acquisition and processing:

When the fault detection option is installed on the equipment, the T200 I incorporates for each channel one of the following measurements:

- ☐ Calculation of the rms load current (if current measurement module installed);
- ☐ Single-phase or three-phase voltage measurement (if voltage measurement module installed).

Monitoring, for the purposes of remote indication and/or local display, of MV substation and T200 I information:

- ☐ Open/closed position of MV switches;
- ☐ "Locked" state of MV switches;
- ☐ Detection of the flow of phase-to-phase or phase-to-earth fault current (on channels provided with the fault detection option);
- ☐ Voltage presence (if the option is present);
- ☐ Automatic control ON/OFF position;
- ☐ Immediate alternating supply undervoltage;
- ☐ Time-delayed alternating supply undervoltage;
- ☐ Charger fault;
- ☐ Battery fault;
- ☐ External 12 V power supply failure;
- ☐ Motorization supply undervoltage.

Dated logging events:

Time-stamped chronological logging of events and measurements. This information can be transmitted to the control centre and archived in logs for consultation and local downloading (in the form of files), by connection of a microcomputer.

Automatic controls:

- ☐ SEC (Sectionalizer): Automatic control for opening the MV switch following detection of a number of fault currents in the source substation reset cycle.
- ☐ ACO (Auto Change Over): Automatic source changeover upon voltage loss detected on one of the channels.
- ☐ BTA (Bus Tie Automatism) : Automatic control for source changeover between 2 incoming switches and one busbar coupling switch.

Backed-up power supply

For all the control unit components, the transmission equipment and the switch motorization with several hours' power reserve in the event of an AC supply outage.

Local communication or communication with the remote control centre

- ☐ One or two communication ports (option) are available for remote communication with the control centre so as to manage two transmission channels. These ports can be used redundantly (normal/backup), for repeater or maintenance applications. The ports use either modems integrated in the COM card or external equipment managed by the rack serial link.
- ☐ A choice of modem for each port allowing any type of mounting:
 - ◆ Radio (600/1200 baud FSK or 1200/2400 FFSK)
 - ◆ PSTN isolated at 8 kV (300 to 14400 bits/s - V32 bis)
 - ◆ GSM / GPRS (European dual-band version 900 MHz – 1800 MHz, US dual-band version 850 MHz – 1900 MHz), SIM card accessible on the front panel
 - ◆ LL isolated at 8 kV (1200 baud FSK)
 - ◆ RS232
 - ◆ RS485 isolated at 2 kV (19200 baud)

Note: In an RS232 link, port 1 is replaced by the RS232 port integral with the COM card and accessible via the 9-pin D-SUB (DB-9) connector on the right of the rack.

- ❑ A catalogue of communication protocols for communication with the control centre, changing constantly:
 - ◆ IEC 870-5-101
 - ◆ IEC 870-5-104
 - ◆ DNP3, DNP3 / IP
 - ◆ Modbus, Modbus / IP
 - ◆ Other proprietary protocols (PID1, PUR2.2, PUR2.4, EDP, TG800, etc.).
- ❑ An Ethernet communication port is available for communication with the control centre or for access from the local PC for consultation/configuration (Modbus IP protocol, IEC 870-5-104, DNP3 IP). This port is accessible on the front of the COM card.
- ❑ A USB communication port is available for communication with the local PC for consultation/configuration. This port is accessible on the front of the COM card.

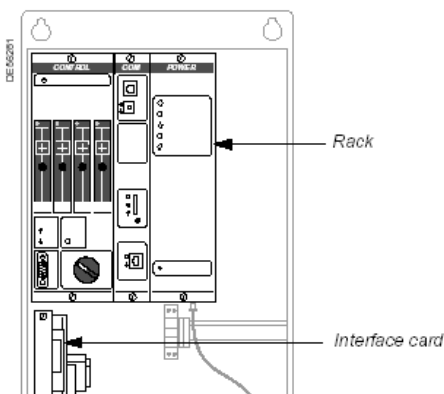
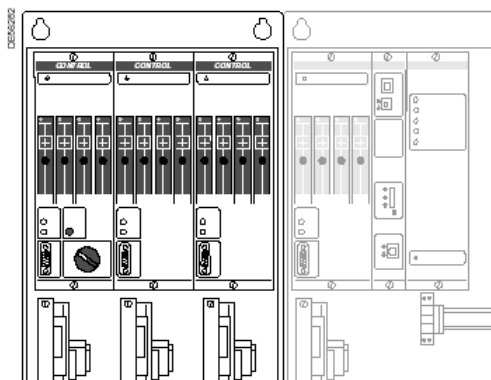
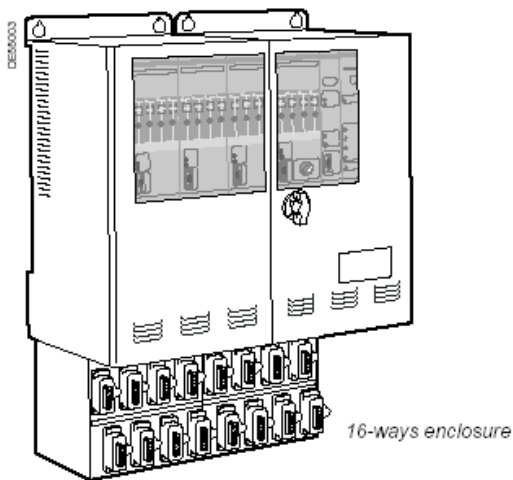
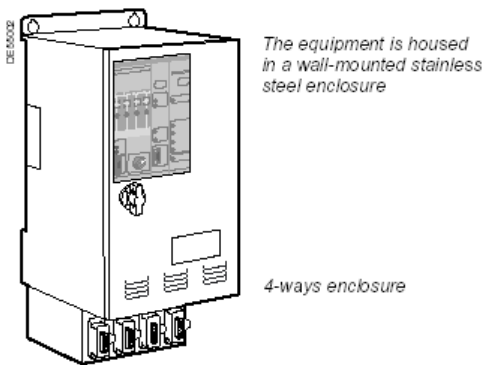
Communication with local equipment (option)

A Modbus RS485 communication port (2 wires - isolated at 2 kV) is available (on option) for dialogue with equipment communicating with the T200 (e.g. Sepam, etc.).

Time synchronization of the equipment

Time setting for event dating can be performed:

- ❑ by the laptop PC for consultation/configuration of the T200 (manually or automatically via the PC time);
- ❑ by the control centre (if the protocol permits);
- ❑ by GPS sync (option). The minimum precision of time setting is in this case approximately 50 milliseconds;
- ❑ by SNTP sync (option) from an Ethernet network. The precision of time setting is in this case approximately one second.



1.2 Description of equipment

The enclosure

The equipment takes the form of a basic stainless steel enclosure grouping all the functional parts for control of four switches and an optional enclosure that can be used to extend the capacity to sixteen switches.

The basic enclosure comprises:

a 6U rack containing all the electronic modules, a slot for transmission equipment, a battery, and a card for interfacing with the switchgear.

Cable glands for cable entry.

The enclosure can be padlocked.

The mechanical specifications are provided in Appendix B.

The 8- or 16-channel extension enclosure

This extension enclosure is required for more than 4 channels.

The extension enclosure rack supports up to 3 Control modules each controlling 4 switches.

Each Control module contains a local control panel (front panel) and a Central Processing Unit (CPU) card.

A single Control module is provided with "Local/Remote" control (that incorporating channels 1 to 4).

The rack

The rack contains three functional modules:

■ The Control module (marked CONTROL)

The Control module comprises a local control panel (front panel) and a Central Processing Unit (CPU) card.

The control module controls the overall operation of the T200 I and the exchange of information with the Power Supply and Communication modules.

This module implements several functions:

- ☐ Interfacing with and monitoring and control of MV switches;
- ☐ Automatic control management;
- ☐ Detection of fault currents on the MV line;
- ☐ Local operation.

■ The Communication module (marked COM)

The communication card serves as an interface between the "control module" cards, the local equipment communicating via Modbus and the control centre. It centralizes, processes and archives information and transmits it in accordance with the communications protocol adopted. It is available in two formats (Standard card, Extended card).

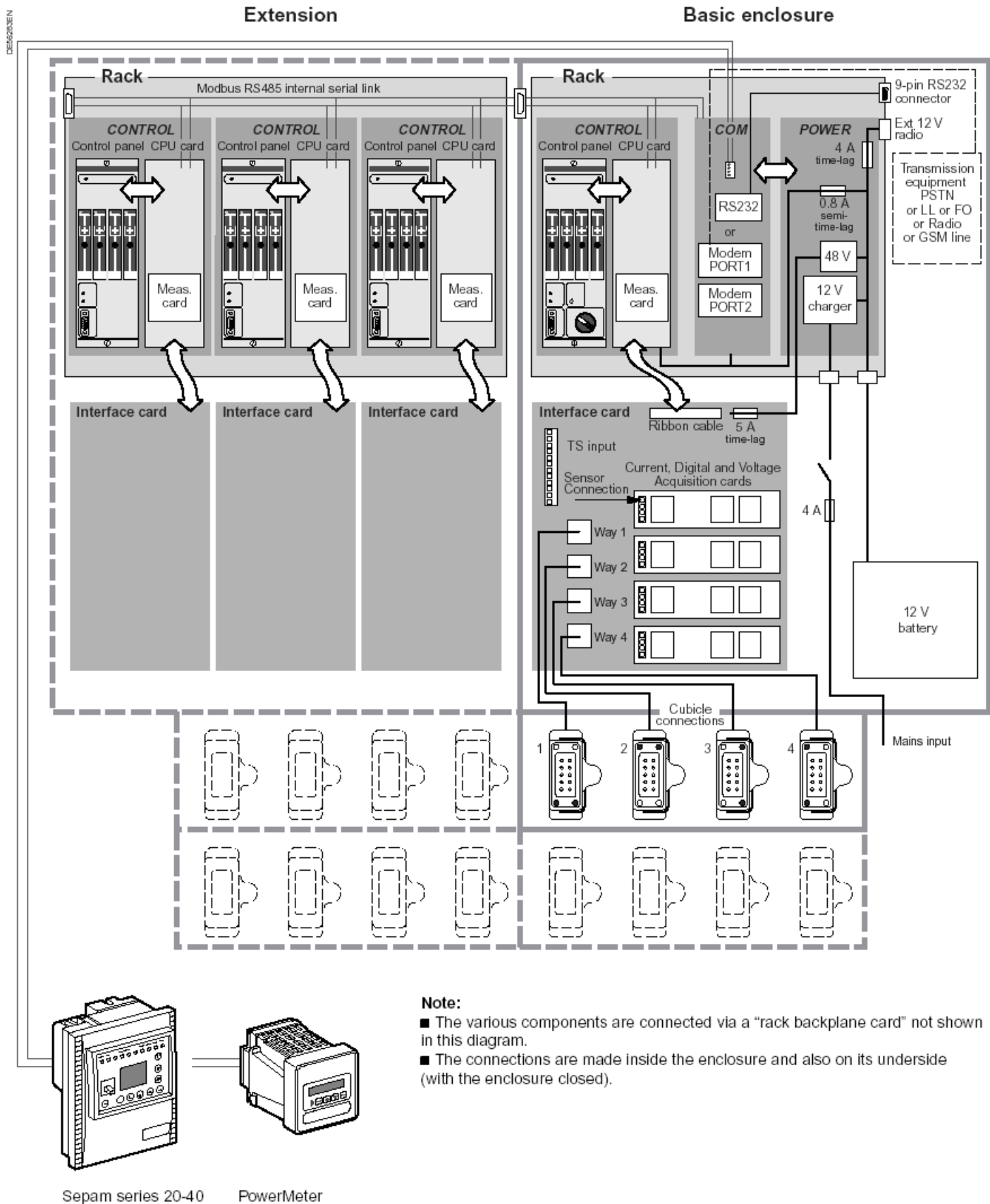
■ The Power Supply module (marked POWER)

It supplies power to the enclosure, the battery charger and the associated self-monitoring equipment.

Interface card

An Interface card is associated with each Control module and mounted vertically below it. It sends orders to the switches and receives external information.

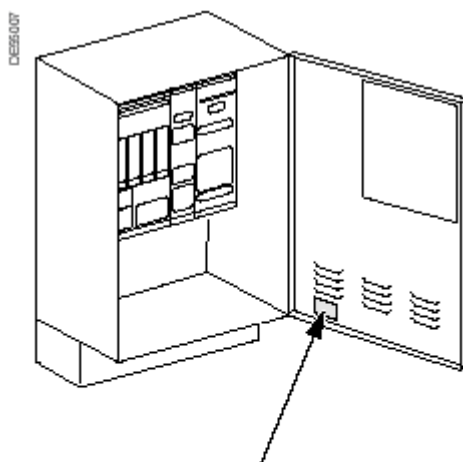
1.3 T200 I block diagram



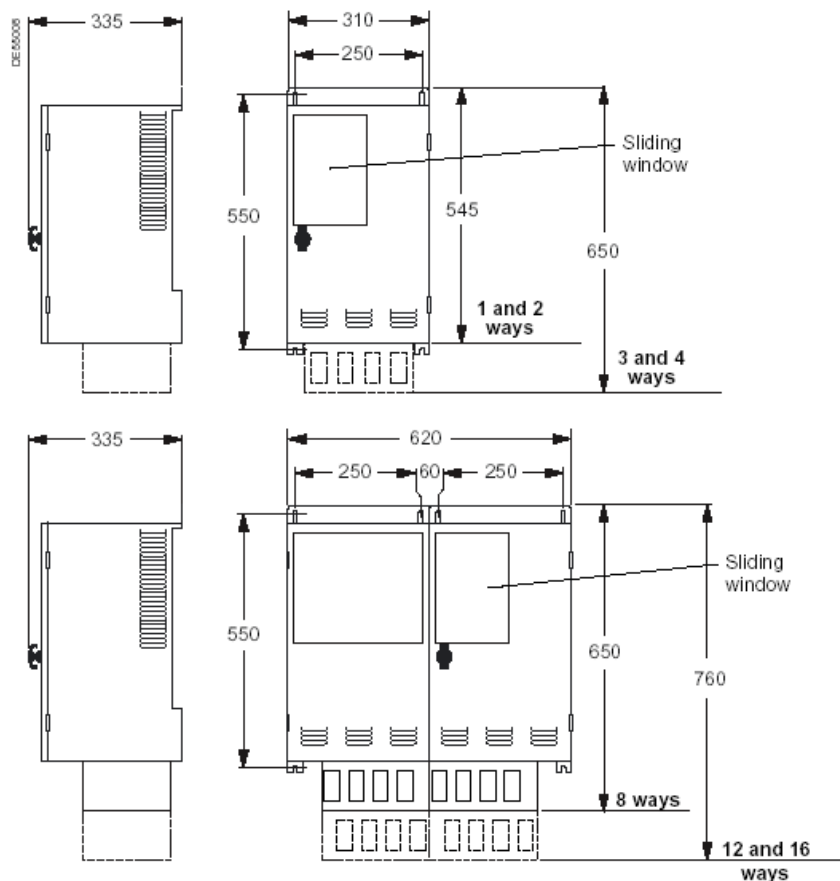
2 Installation

2.1 Mechanical specifications

Dimensions



Identification



A drilling template is supplied with the enclosure in the equipment packing box.

Weight

1 and 2-channel enclosure: 37 kg
 3 and 4-channel enclosure: 40 kg
 8-channel enclosure: 60 kg
 12-channel enclosure: 65 kg
 16-channel enclosure: 70 kg

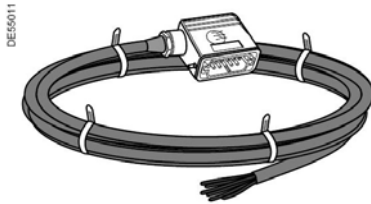
Enclosure opening

The doors open to the right. Turn the lock button on the left-hand side of the door a quarter of a turn and open the door.
 A padlock with an 8 mm handle can be passed through the hole in the button to lock the enclosure securely. Information on the control panel can be viewed through the window in the enclosure door.
 It is possible to slide this window when the lock button is in the horizontal position and access the various control panel options.

Enclosure mounting

Wall mounting using four screws with a maximum diameter of 10 mm (8 mm recommended):
 two screws at the top of the enclosure and 2 at the bottom. The centrelines are not adjustable. A drilling template supplied with the enclosure is used to determine where to drill the holes required to mount the enclosure.
 Six screws are required to mount the extension cubicle, four at the top and two at the bottom.
 Ensure that the vents (on the right and left-hand sides and at the back) are not obstructed and that the air can circulate freely.

2.2 Cabinet/MV cubicle connection

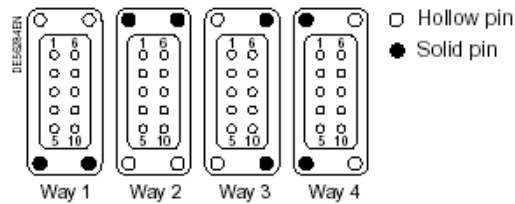


Each switchgear connection cable is fitted with two label holders (one at each end) on which the number of the channel to which it is assigned can be noted.

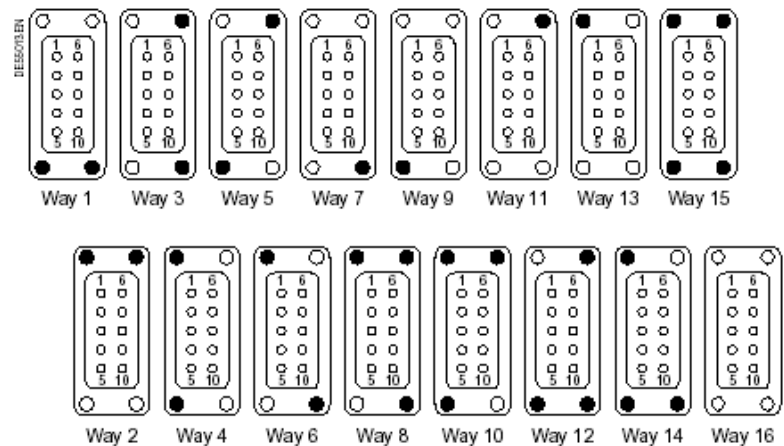
Connecting the enclosure (HA10 version)

The cubicle connection cable is fitted with a connector that plugs into the base corresponding to the channel used (secured in position via a lever mechanism). Before this operation is performed, the polarizing pins must be positioned as shown in the diagram below, according to the chosen channel number. The polarizing pins are supplied in a plastic bag attached to the inside of the basic enclosure.

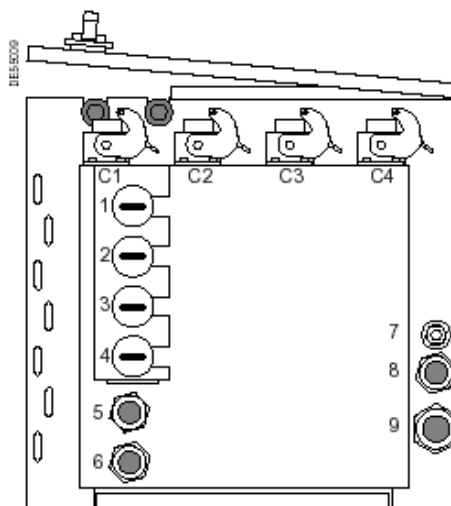
Position of polarizing pins for 1- to 4-channel enclosure (HA10 connectors on cable side, front view)



Position of polarizing pins on a 16-channel enclosure (HA10 connectors on cable side, front view)



"Easergy T200 I 4-channel" enclosure, bottom view



- 1 – Blanking plate: SW1 current
- 2 – Blanking plate: SW2 current
- 3 – Blanking plate: SW3 current
- 4 – Blanking plate: SW4 current
- 5 – Cable gland: external connection terminal block
- 6 – Cable gland: external connection terminal block
- 7 – Earth terminal stud
- 8 – Cable gland: AC supply
- 9 – Cable gland: transmission equipment link
- C1 to C4: HA10 SW1 to SW4 cubicle connection base.

Connecting the MV cubicle

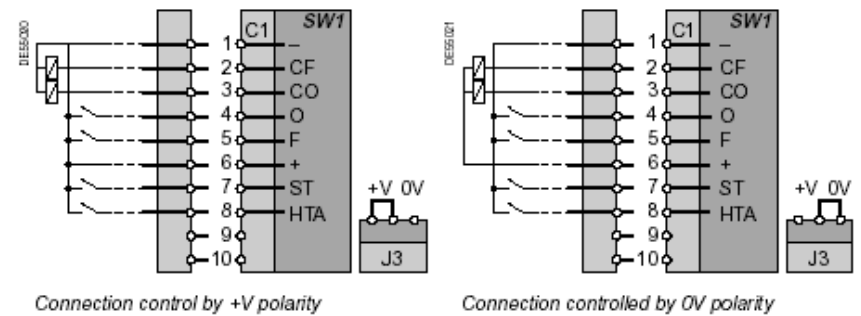
The cable markings are as follows:

| Connector pin | Marking | Function |
|---------------|---------|--------------------|
| 1 | - | 0V |
| 2 | CC | Closing control |
| 3 | OC | Opening control |
| 4 | O | Open position |
| 5 | F | Closed position |
| 6 | + | + V |
| 7 | ST | Earthing switch |
| 8 | HTA | MV voltage present |
| 9 to 10 | | Not used |

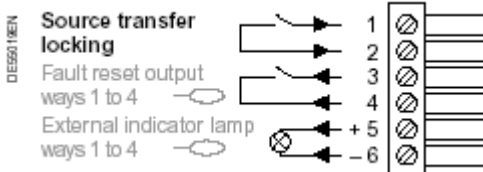
Control polarity

The switches can be controlled by 0V or +V polarity (24 or 48 V according to the model). The control polarity is selected according to the position of the J3 connector on the Interface card.

! Configure the control polarity on the interface card before connecting the cable to the switch. Switches SM6 and RM6 should be configured for control by +V (default configuration). To change it, see following page).

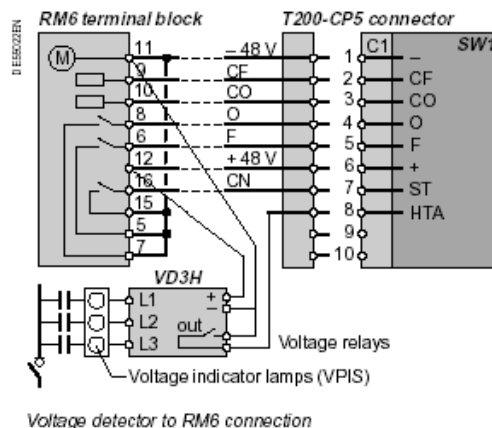


The "source changeover" operation requires the source transfer locking mechanism to be wired after the cubicle (MITOP) has been tripped, as well as the addition of a voltage indicator.



Lock connection ("J1" terminal block on the 4-way interface or "J9" on the 2-way interface).

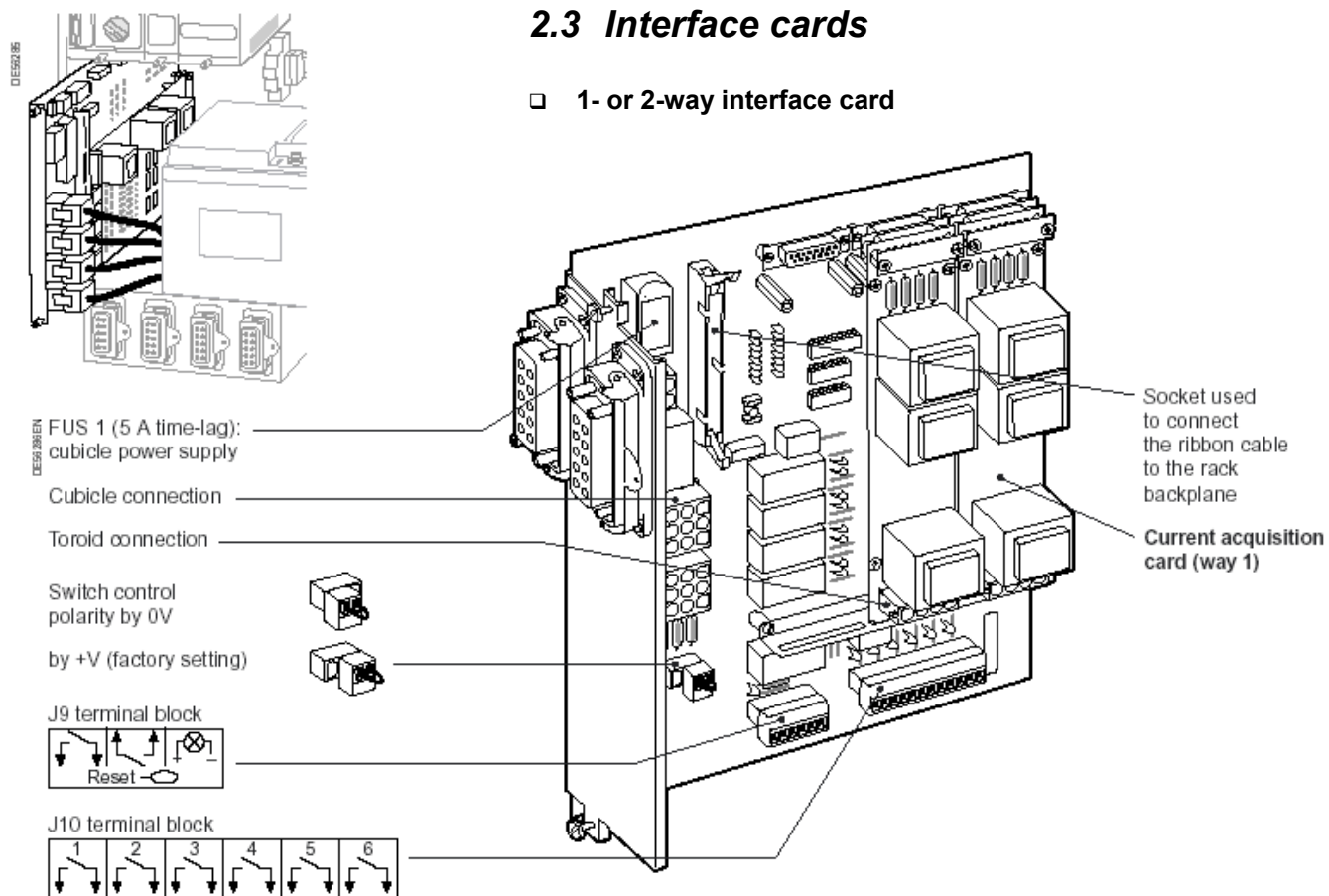
ACO automatic control (source changeover)



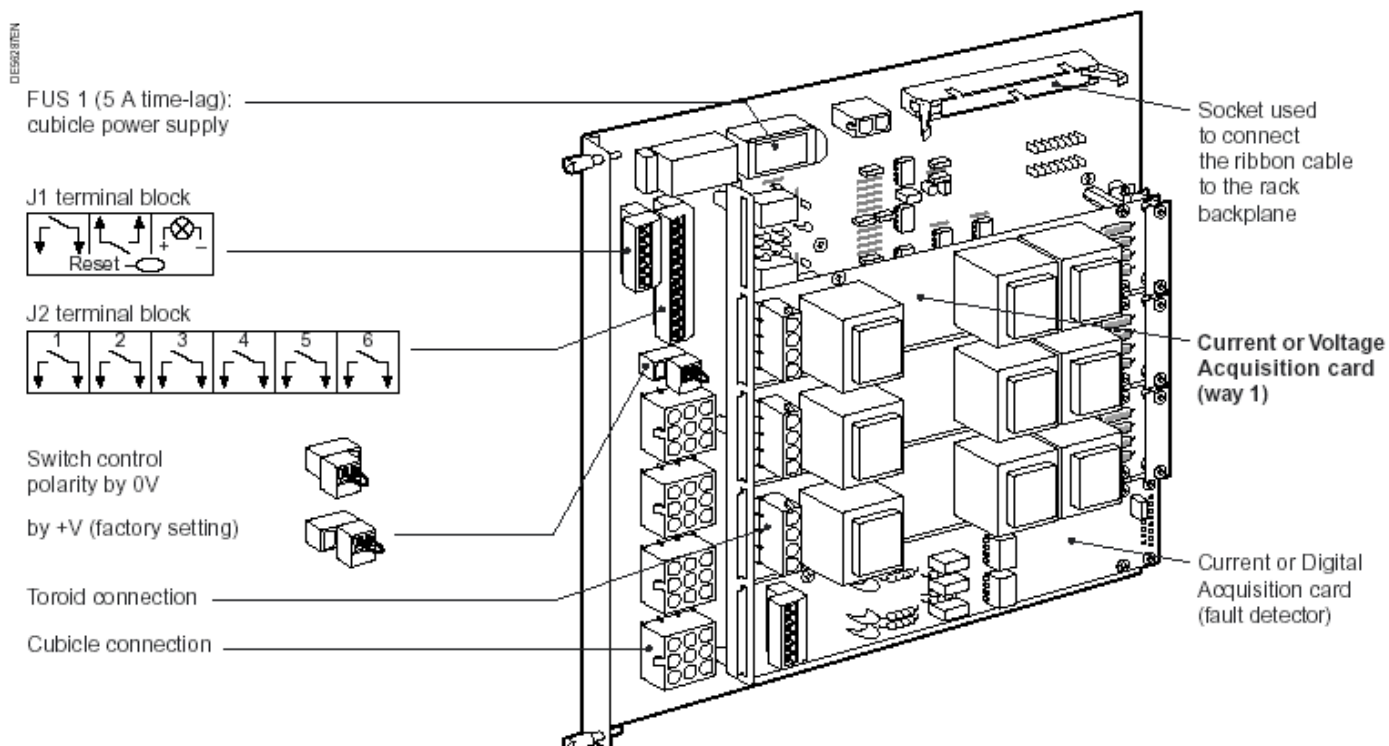
Note: The power-on detector model adopted corresponds to the voltage supplied for control of the switches (24 V or 48 V or 110 V) – see corresponding user manual for the VD3H relay.

2.3 Interface cards

□ 1- or 2-way interface card

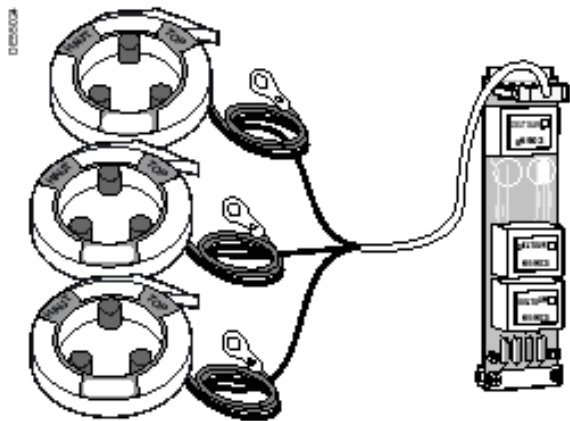


□ 4-way interface card (4- to 16-channel enclosure)

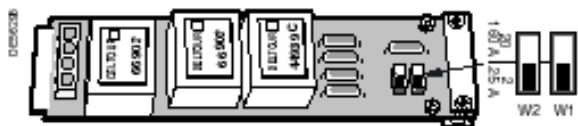




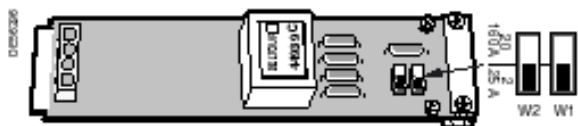
T200-AC: fault current internal detection acquisition card (type A: 3 phase toroids)



T200-AC with three split toroids



T200-AS: acquisition card for internal detection of fault current (type B: 2 phase toroids + 1 homopolar toroid)



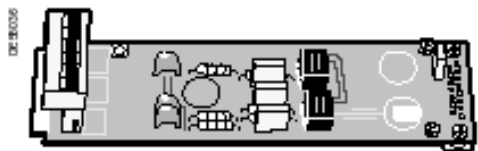
T200-AH: acquisition card for internal detection of fault current (type C: 1 homopolar toroid)



T200-AT: acquisition card for three-phase voltage measurement



T200-AT-BT: acquisition card for single-phase voltage measurement



T200-AD: fault current detection digital acquisition card (external detector)

2.4 Measurement kits

A fault detection kit is supplied with the equipment on option. Each model available allows the equipment to be adapted to the type of measurement fault detection wanted by the user.

The choice of measurement acquisition model depends on the type of measurements and the type of switch used.

- The current fault detection kit:** This consists of three items :
 - a current acquisition module
 - a connecting cable
 - a set of three opening toroids for phase and/or homopolar current measurement.
- The voltage fault detection kit:** This consists exclusively of the voltage acquisition module.

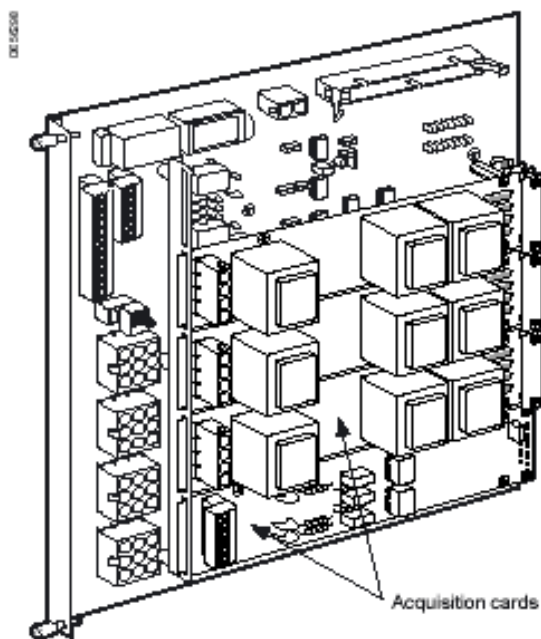
The following table summarizes the measurement potential depending on the kit used:

| Reference | Type of measurement | Setting |
|-------------------|--|--|
| AF-T200-AC | Type A setup: 3 phase currents | None |
| AF-T200-AS | Type B setup: 2 phase currents + 1 zero sequence current | 2 zero sequence current ranges depending on jumpers W1 and W2: 20-160 A or 2-25 A |
| AF-T200-AH | Type C setup: 1 zero sequence current | 2 zero sequence current ranges depending on jumpers W1 and W2: 20-160 A or 2-25 A |
| AF-T200-AT | 3 three-phase voltages coming from the power transformers (110 V/□3 = 63.5 VAC inputs) | None |
| AF-T200-AT-BT (*) | 1 single-phase voltage coming from the LV source of the T200 (230 VAC). | None |
| AF-T200-AD | TSS card 3 (for external fault detector) | None |

(*): requires the installation of an additional kit including, in particular, a 230V/7V transformer in the T200 enclosure.

The types of indications associated with the measurement and fault detection are shown in the following table:

| Type of measurement | Reference | Measurement | Indication 1 | Indication 2 | Indication 3 |
|---------------------|---------------|----------------------------------|-------------------|------------------------|---------------|
| I measurement | AF-T200-AC | Medium phase current (L1 and L2) | Phase fault | Earth fault | Not used |
| | AF-T200-AS | Medium phase current (L1 and L2) | Phase fault | Earth fault | Not used |
| | AF-T200-AH | Not used | Not used | Earth fault | Not used |
| U measurement | AF-T200-AT | Three-phase voltage measurement | Voltage dip fault | Residual voltage fault | Not used |
| | AF-T200-AT-BT | Single-phase voltage measurement | Voltage dip fault | Residual voltage fault | Not used |
| TSS card 3 | AF-T200-AD | Not used | Phase fault | Earth fault A | Earth fault B |



Installing the acquisition/measurement cards

Each acquisition card is managed by 1 channel and is positioned on an interface card. Their location is marked "channel 1 to 16" on the label on the front of the card.

Installing the cards:

- Switch off the enclosure mains power supply.
- Disconnect the battery power cord from the POWER card.
- Disconnect the cables connected to the interface card.
- Loosen the retaining screws on the front of the interface card and then remove the card.
- Configure the acquisition module according to the zero sequence current range (AF-T200-AH, AF-T200-AS only).
- Install the measurement module (AF-T200-xx) on the slot corresponding to the channel used for measurement.
- To do so, slide the end of the acquisition card into the slot corresponding to the location of the channel in question
- Connect the acquisition card to the SUB-D 15-pin connector.
- Fasten the acquisition card to the interface card with the 2 captive screws provided for the purpose.
- Fit the interface card back in the enclosure, then fasten the card by tightening the 2 mounting screws.
- Reconnect the cables to the interface card.
- Reconnect the battery power cord to the POWER card.
- Restore the mains power supply on the enclosure.

Installing and connecting toroids in the cubicle

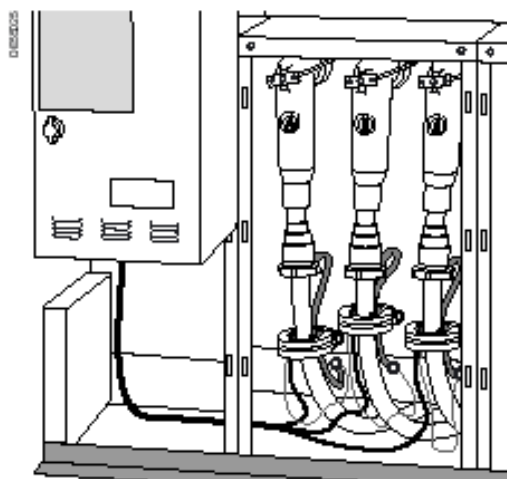
Depending on the type of kit, the setup will concern:

- 3 opening phase toroids (module AF-T200-AC)
 - 2 opening phase toroids + 1 homopolar toroid (module AF-T200-AS)
 - 1 homopolar toroid (module AF-T200-AH)
- ☐ The toroids are of the opening type and have an automatic retaining system for cables of dia. 30 to 45 mm.
- ☐ When fitting the toroids on the cables, it is essential to comply with the direction of positioning: HAUT/TOP marking facing upward, wire exit downward (see illustration opposite).

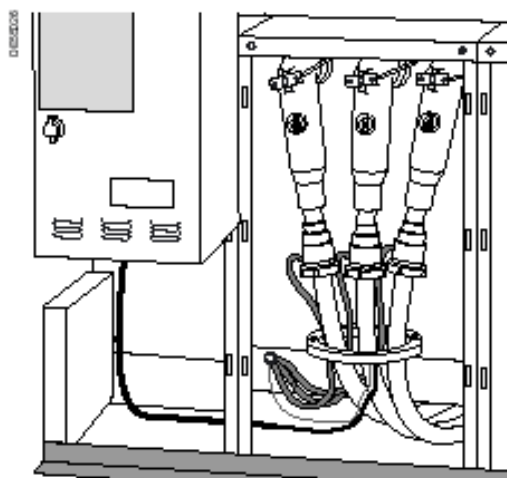


IMPORTANT NOTE:

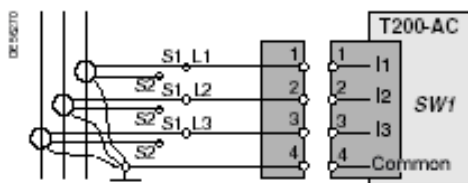
- ☐ The shielding of each MV cable must be re-inserted inside the corresponding toroid, before being connected to earth (see diagram).
- ☐ The homopolar toroid must always be connected to the "L3" wire of the toroid sensor connecting cable.
- ☐ The white wire on the toroid secondary (S2) is connected internally to the green/yellow wire.
- ☐ The green/yellow wire must be connected to the same frame earth as the cubicle.
- ☐ The blue wire on the toroid secondary (S1) is that which gives the T200 current measurement.
- ☐ The low-voltage insulation of the Easergy toroids means they can only be used on insulated cables.
- ☐ Cables of voltage rating greater than 1000 V must have a shield connected to earth.



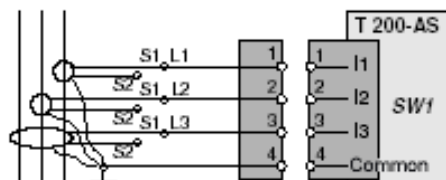
Installation of three split toroids



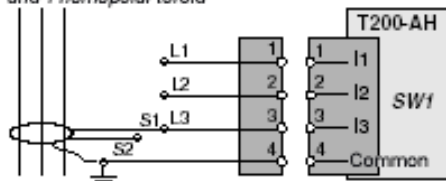
Installation of a homopolar toroid



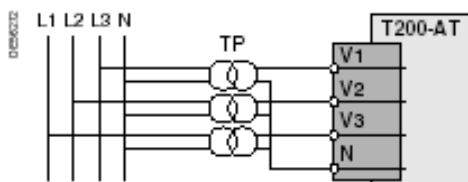
Connection with 1 toroid per phase



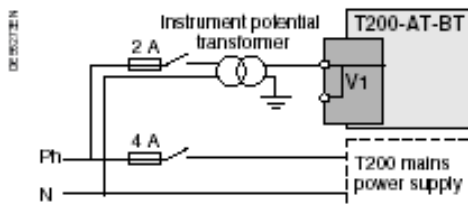
Connection with 2 phase toroids and 1 homopolar toroid



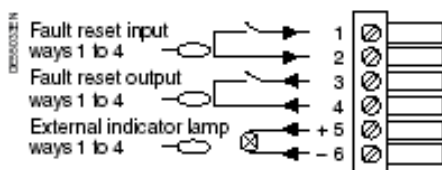
Connection with 1 homopolar toroid



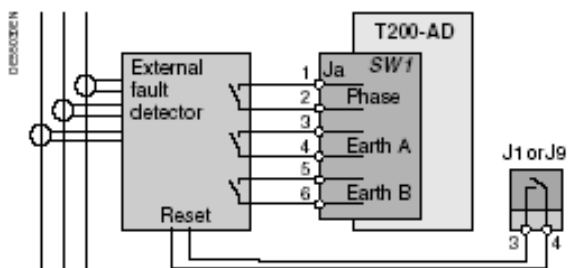
Connection with three-phase voltage inputs



Connection with 1 single-phase voltage input



"J1" or "J9" terminal block



Use of an external fault detector with a fault reset output

Connection of current inputs to the interface card

To install the connecting cable:

- ☐ Use the 4 x 1.5 mm² cable (U1000RO2V).
- ☐ Remove the metal plate, containing the cable glands and blanking plates, fastened by a screw to the base of the enclosure.
- ☐ Dismount the blanking plate corresponding to the routing of the toroid cable to be installed.
- ☐ Insert the cable gland after loosening the associated nut.
- ☐ Tighten the screw and put the metal plate back in place.

The 4-pin connector of the cable coming from the toroids is to be connected, in the lower left-hand part of the enclosure, to the current acquisition card for the channel in question.

(see illustration in section on *Interface cards*).



Note: the homopolar toroid must always be connected to the "L3" wire of the toroid sensor connecting cable.

Connection of voltage inputs to the interface card

For voltage measurement, it is necessary to install "Voltage acquisition (AT or AT-BT)" cards on the Interface card.

- **Three-phase voltage measurement (T200-AT):** The 3 voltage inputs coming from the power transformer are wired directly to the voltage acquisition module.
- Single rated input voltage: 65 Vac (maximum acceptable 135 Vac).
- Connection by 1.5 mm² cable (not supplied).
- Insert the cable via the corresponding cable gland on the base of the enclosure.
- Connect the cable to the spring terminals provided for the purpose, on the voltage acquisition module for the channel in question (V1, V2, V3, N) installed on the interface in the lower left-hand part of the enclosure (see enclosed drawing for connection).

Note: The cable for connection of the voltage inputs to the power transformers is not supplied with the equipment. It is important to ensure that the cable and its use outside and inside the enclosure comply with the electrical standards of installation.

- Single-phase voltage measurement (T200-AT-BT):

- Input voltage: 220 Vac
- Connection: Kit already installed in factory on the last channel of the enclosure.

Connection of an external fault detector

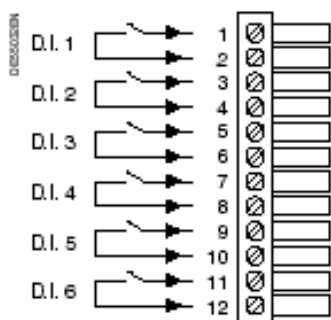
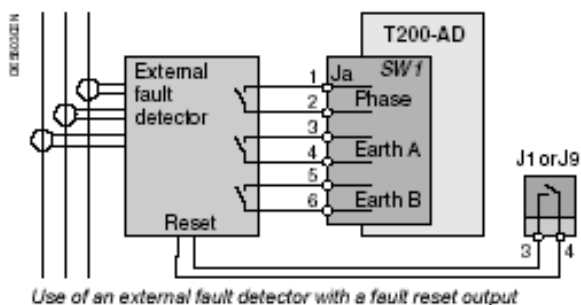
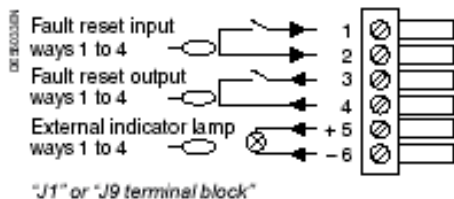
To use an external detector of fault current flow, it is necessary to install digital acquisition cards (AF-T200-AD) on the Interface card.

A Digital Acquisition card manages one channel.

This card can receive one phase fault notification and two earth fault notifications.

It is possible to install 4 Acquisition cards on one 4-way Interface card (1 per channel to be monitored).

The use of an external fault detector requires wiring of the Fault Reset output, taking the form of a dry loop (see section on *Connecting an external Reset system*).



Digital input connection ("J2" or "J10" terminal block)

2.5 Miscellaneous input/output wiring

Connection of an external indicator lamp

The external indicator lamp (optional) is used to indicate a fault current. An indicator lamp can be connected to each group of four channels, or a single indicator lamp can be connected to the entire enclosure. In this case, the "external indicator lamp" outputs from each Interface card must be connected in parallel with the correct polarities.

- Connection by 1.5 mm² cable (not supplied).
- Insert the cable via the corresponding cable gland on the base of the enclosure.
- Connect the cable to the 2 screw terminals provided for the purpose on terminal block "J1" (4-way Interface) or "J9" (2-way Interface) on the Interface card.

NB: the terminals to be connected are polarized. Comply with the direction of connection (+ and -).

Connection of an external Reset system

Fault Reset input:

Connection of an external Reset system makes it possible to clear the fault currents stored in memory by the internal fault detector of the T200.

- Connection by 1.5 mm² cable (not supplied).
- Insert the cable via the corresponding cable gland on the base of the enclosure.
- Connect the cable to the 2 screw terminals provided for the purpose on terminal block "J1" (4-way Interface) or "J9" (2-way Interface) on the Interface card (see terminal block diagram).

Note: This input is also used to lock source transfer in the case of ACO automation (see page 5).

Fault Reset output:

This output is used to erase the fault currents stored in an external fault current detector.

Information is supplied in the form of a dry loop.

- Insert the cable via the corresponding cable gland on the base of the enclosure.
- Connect the cable to the 2 screw terminals provided for the purpose, on terminal board "J1" (4-channel interface) or "J9" (2-channel interface) of the Interface card.

Connection of digital inputs

- Six inputs are available for the acquisition of digital information.
- Information is received in the form of a dry loop.
- Insert the cable via the corresponding cable gland on the base of the enclosure.
- Connect the cable to the screw terminals provided for the purpose on terminal block "J2" (4-way Interface) or "J10" (2-way Interface) on the Interface card.

2.6 Transmission equipment

Mounting slot

A transmission interface slot (LL or RS485/232, modem, optical fibre cable, radio, etc.) is provided at the top right-hand side of Easergy **T200 I.** A slide-mounted support offers various adjustment possibilities.

Available space (see illustration opposite)

- Height: 320 mm
- Width: 85 mm
- Depth: 240 mm.

Transmission equipment power supply

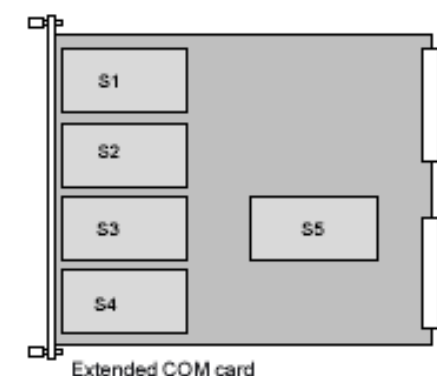
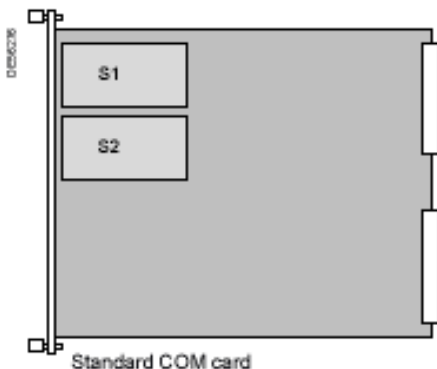
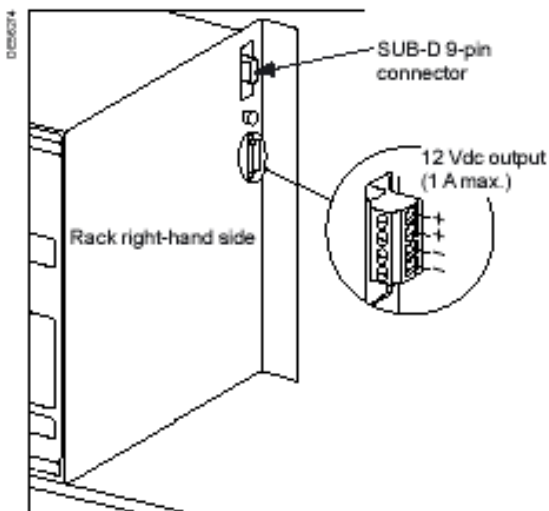
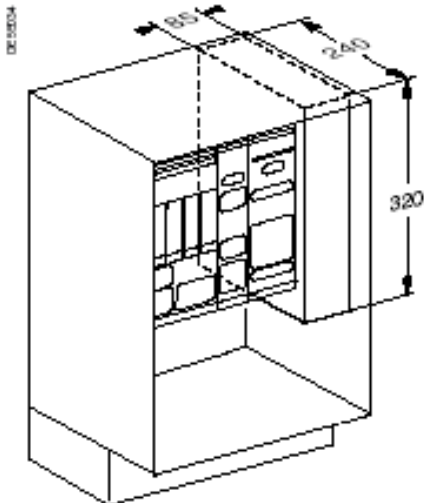
The 12 Vdc supply for the remote transmission equipment is provided via the connector on the right-hand side of the rack.

The RS232 serial link is provided on the SUB-D 9-pin connector also located on the right-hand side of the rack.

The Radio link is provided on the RJ45 8-pin connector located on the front of the COM card.

Transmission ports available depending on COM card versions

- The **Standard COM** card has:
 - An **Ethernet link** (connector RJ45) available on the front panel at the height of slot S1.
 - An **USB link** (type B) available on the front panel also at the height of slot S1.
 - A **communication channel No. 1: RS232** serial link available on a SUB-D 9-pin connector located on the right-hand side of the rack.
 - A **communication channel No. 2: customizable** link (PSTN, radio, GSM, etc.) which depends on the modem installed on slot S2 of the COM card. Modem output available on the front of the channel.
 - **Note:** Communication channels No. 1 and 2 allow interfacing with external transmission equipment (modems, interfaces, radios, etc.) that can be installed on the sliding support grid located on the right-hand side of the rack.
- The **Extended COM** card has:
 - An **Ethernet link** (connector RJ45) available on the front panel at the height of slot S1
 - An **USB link** (type B) available on the front panel also at the height of slot S1
 - A **communication channel No. 1** consisting of either:
 - an **RS232** link on the SUB-D 9-pin connector located on the right-hand side of the rack.
This link is available only if no additional communication modem is detected on slot S3.
 - a **customizable** link (PSTN, radio, GSM, etc.) which depends on the modem installed on slot S3 of the COM card. Modem output available on the front of the channel
Note: The RS232 link on the SUB-D 9-pin connector on the right-hand side of the rack is deactivated if a modem is installed on slot S3.
 - A **communication channel No. 2:** customizable link (PSTN, radio, GSM, etc.) which depends on the modem installed on slot S4 of the COM card. Modem output available on the front of the channel.
 - An **optional communication channel for a Modbus local area network:** this channel must receive an **RS232** modem in slot **S2**. This channel allows interfacing with auxiliary equipment of the SEPAM, OTB, PM500 or T200 type, for example.
The addition of an external RS232/RS485 interface, installed in factory on the right-hand side of the rack, is necessary to communicate with this auxiliary equipment.
 - An **optional GPS module** for T200 time synchronization. This GPS module should be installed on slot S5 of the COM card. A specific exterior antenna should also be connected to this module to allow reception of GPS satellite signals.



Ethernet and USB links

The USB and Ethernet links are available on the front of the COM card.

For linking with these transmission modes, the T200 complies with the connection standard used (RJ45 and USB type B).

Connection of a PSTN line

Connect the PSTN line to the terminals provided for the purpose on the DIN rail alongside the mains fuse holder (see illustration opposite).

Setting up a GSM/GPRS modem (internal)

The GSM/GPRS modem is installed on the COM card of the T200 on one of the modem slots (No. 1 or 2).

The antenna connector and the SIM card are accessible on the front of the COM card.

- Attach the antenna to the wall of the substation (preferably outside).
- Connect the antenna cable to the modem antenna connector.
- Insert the SIM card (T200 powered down).

RS232/RS485 interface (external)

This interface is used only to implement a T200 Supervisor remote RS485 link.

Note: This interface is not used for the Modbus local area network link (see section on *Setup of Modbus local area network equipment*).

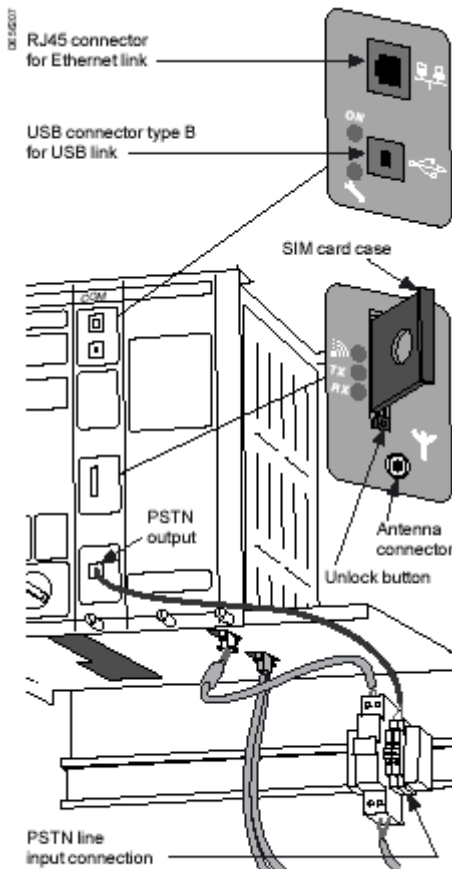
The interface is mounted on the sliding support grid. To perform connection and position the microswitches, the grid can be loosened and removed.

2-wire RS485 setup :

- ☐ Connect the 2 wires to terminals A and B (2F ↔);
- ☐ Connect the cable shielding to the GND terminal;
- ☐ Set selection jumpers 2F/4F to "2F" (on the right);
- If the T200 is at the end of the RS485 line, set the "RC" jumper at the top of the interface to the right, to match the line impedance on the "2F" input/output end of the interface. In theory, impedance matching is performed at both ends of the RS485 line.
- If line polarization has not been already performed at the SCADA system end, set the "+5V" and "GND" jumpers at the top of the interface to the right, so as to polarize the line at the "2F" input/output end of the interface. In theory, this polarization should be performed at only a single point on the RS485 line, preferably at the Supervisor end.

4-wire RS485 setup :

- ☐ Connect the 2 Receive wires to terminals A and B (4F →);
- ☐ Connect the cable shielding (GND terminal);
- ☐ Connect the 2 Transmit wires to terminals A and B (4F ←);
- ☐ Connect the cable shielding (GND terminal);
- ☐ Set selection jumpers 2F/4F to "4F" (on the left).
- If the T200 is at the end of the RS485 line, set all the interface "RC" jumpers to the right, to match the line impedance in Send and Receive modes. In theory, impedance matching is performed at both ends of the RS485 line.
- If line polarization has not been already performed at the SCADA system end, set all the "+5V" and "GND" jumpers of the interface to the right, so as to polarize the line in Send and Receive modes. In theory, this polarization should be performed at only a single point on the RS485 line, preferably at the Supervisor end.

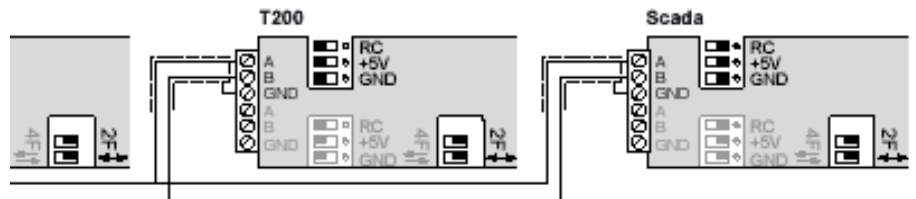


The above figure illustrates the configuration channel 1 = GSM/GPRS channel, channel 2 = PSTN modem

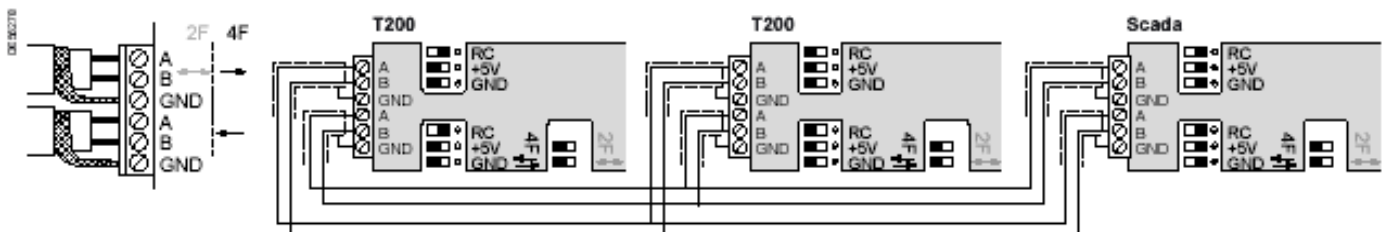
The above figure illustrates the configuration channel 1 = GSM/GPRS channel 2 = PSTN modem



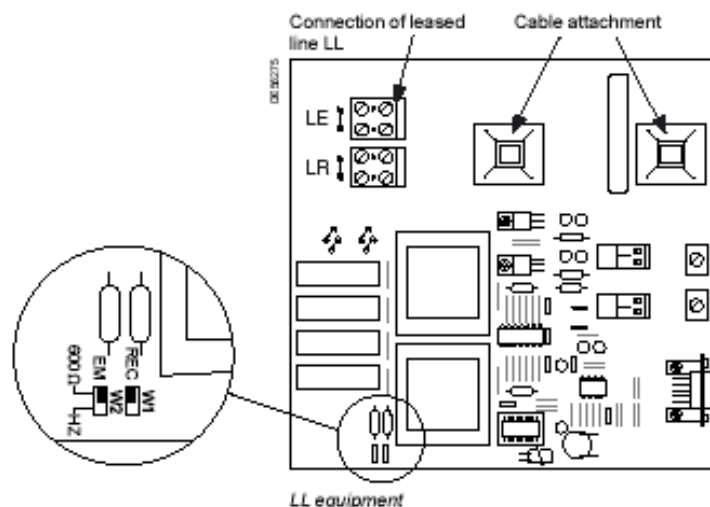
Location of selection jumpers on RS232/RS485 card



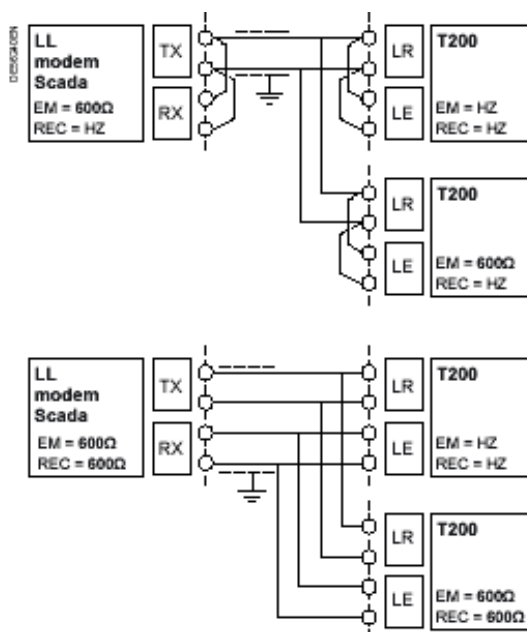
- ☐ Connect the 2 Receive wires to terminals A and B (4F →);
- ☐ Connect the cable shielding (GND terminal);
- ☐ Connect the 2 Transmit wires to terminals A and B (4F ←);
- ☐ Connect the cable shielding (GND terminal);
- ☐ Set selection jumpers 2F/4F to "4F" (on the left).
- If the T200 is at the end of the RS485 line, set all the interface "RC" jumpers to the right, to match the line impedance in Send and Receive modes. In theory, impedance matching is performed at both ends of the RS485 line.
- If line polarization has not been already performed at the SCADA system end, set all the "+5V" and "GND" jumpers of the interface to the right, so as to polarize the line in Send and Receive modes. In theory, this polarization should be performed at only a single point on the RS485 line, preferably at the Supervisor end.



Leased Line Interface (external)



⚠ It is important to link the transmission cable shielding. The shields must be earthed at one point in the line (preferably on the PC side of the remote control station).

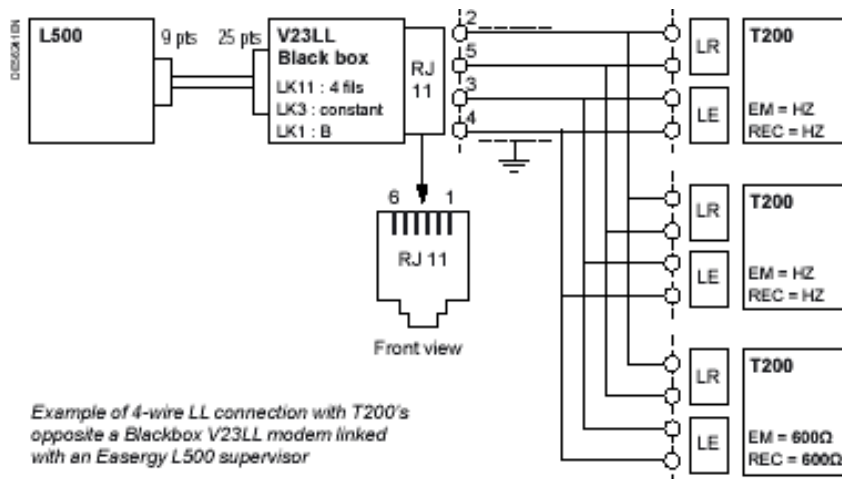


2-wire LL link:

- Connect the 2 wires of the LL line to the LR terminals of the T200 interface and short-circuit the LE and LR terminals of the interface.
- Set the "HZ/600Ω" jumper to "600 Ω" (at one end only: Send or Receive) and this only on the LL interface of the T200 at end of line.
- Do the same at the Supervisor end. In theory, the 600 Ω line impedances should be present at both ends of the LL line.
- Connect the shielding of the LL transmission cable to ground at the Supervisor end.
- Important note: The 2-wire LL link is possible only if the same type of modem as on the T200 is used at the SCADA system end. Otherwise, a 4-wire LL link must be adopted.**

4-wire LL link:

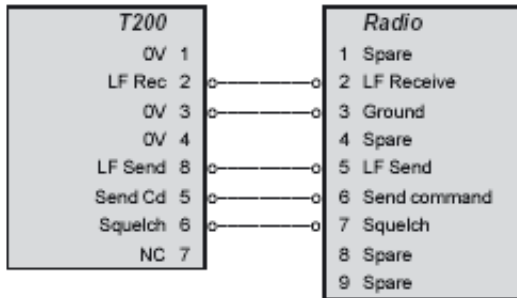
- Connect the 4 wires of the LL line to the LR terminals of the T200 interface, crossing the Send and Receive lines relative to the Supervisor (LE or TX → LR and LR or RX → LE).
- Set the "HZ/ 600Ω" selection jumpers to "600 Ω" on the LL interface of the T200 at end of line (Send end and Receive end).
- Do the same at the Supervisor end. In theory, the 600 Ω line impedances should be present at both ends of the LL line.
- Connect the shielding of the LL transmission cable to ground at the Supervisor end.



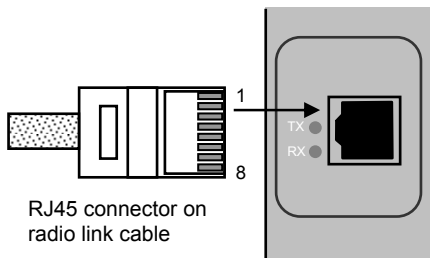
Example of 4-wire LL connection with T200's opposite a Blackbox V23LL modem linked with an Essergy L500 supervisor

Connection to an analogue radio transceiver

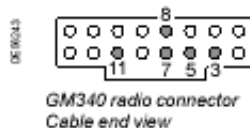
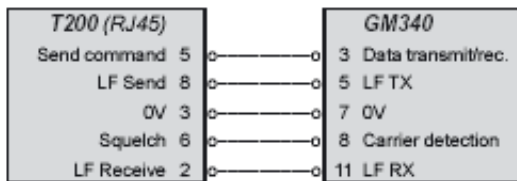
(accessible on the RJ45 connector on the front of the internal radio modem of the COM card)



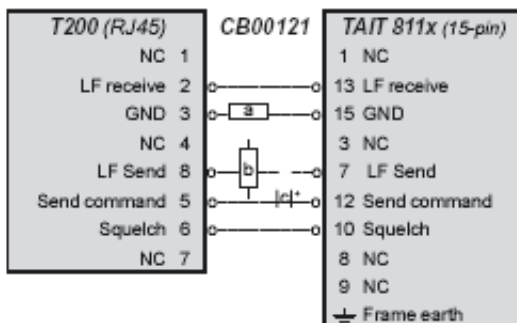
COM module



Example of connection with a Motorola GM340 analogue radio



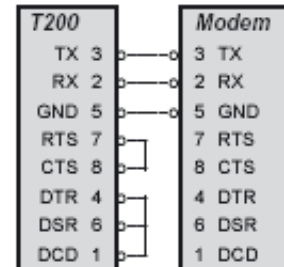
Example of connection with a TAIT 811x analogue radio (cord pre-wired in factory: CB00121)



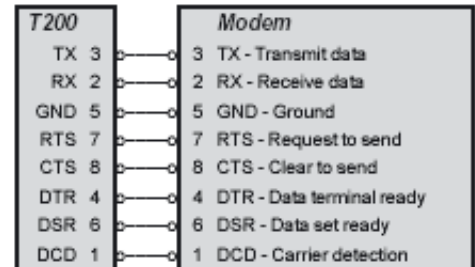
a = resistor 1/4W 5% 2.2 kΩ
b = resistor 1/4W 5% 820 Ω
c = electrolytic capacitor 4.7 μF/63 V
NC = Not Connected.

RS232 external modem connections (PSTN, radio modem, GSM, etc.)

(accessible on SUB-D 9-pin connector located on the right-hand side of the rack)

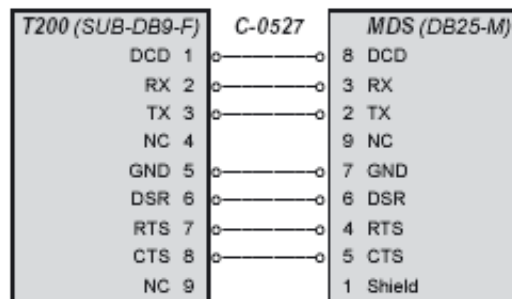


No CTS, DCD, DSR management



CTS, DCD, DSR management

Example of connection with an MDS 4710 digital radio (cord pre-wired in factory: C-0527)



2.7 Enclosure power supply

Connecting an AC supply

⚠ To prevent any risk of electric shock or burns, check that the mains supply is disconnected before carrying out any work on the enclosure.

- Switch off the supply circuit by moving the central lever on the safety fuse located in the centre to the down position. It is not necessary to remove the fuse.
- Insert the “AC supply” cable (2 x 2.5 mm²) into the appropriate cable gland and connect it using the shortest possible length of cable to the bottom screw terminals on the safety fuse (phase on the right, neutral on the left).
- Check that the mains connector is correctly plugged in under the rack (see illustration below).

⚠ IMPORTANT NOTE: The “AC supply” input is insulated at 10 kV with respect to the enclosure earth. It is important to ensure that the cable and its use outside and inside the enclosure do not damage this insulation.

Earthing

⚠ The equipment must be earthed to ensure EMC.

For this purpose, a special stud of diameter 8 mm is provided under the enclosure. Use an earth cable of cross-section greater than or equal to 16 mm².

Installing the battery

The battery is of 12 V - 24 Ah type. It is housed in the lower part of the enclosure (see illustration opposite).

Connecting the battery

⚠ Comment: the battery must only be connected to the enclosure when the equipment is powered up.

- Connect the battery to the equipment by plugging the connector into the base under the power supply module (see illustration opposite).
- The connector is polarized.
DO NOT FORCE IT INTO POSITION.

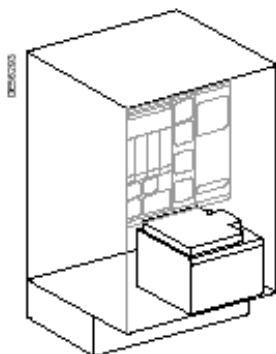
Switching on the AC supply

- Close the safety fuse inside the enclosure (see illustration opposite).

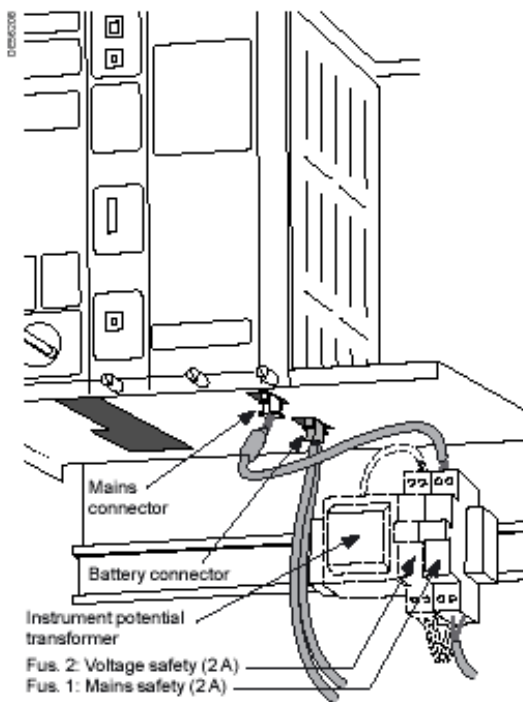
Normal use

When the operations described above have been performed, the normal power supply to the equipment is resumed and the battery can be charged. The “normal service” status is as follows (on the front panel):

- On the **Power supply** module:
 - The “**AC supply OFF**” and “**Battery fault**” indicator lamps are off;
 - The “**Rack 12 V present**” and “**Ext. 12 V present**” indicator lamps are lit steadily;
 - The “**48 V present**” indicator lamp is lit steadily (after a 20 s time delay);
 - The fault indicator lamps are off.
- On the **Control** module:
 - The “Local/Remote” switch is set to “**Remote**” mode;
 - The indicator lamps reflect the indications, in particular the position of the cubicles.
- On the **Communication** module:
 - The “**ON**” indicator lamp is lit;
 - The “**fault**” indicator lamp goes off quickly;
 - The other communication indicator lamps remain off.



The battery is installed at the front of the enclosure (lugs to the right)



Plug in the battery connector below the rack

3 Connection to the T200

Easergy T200 I must be configured from a configuration PC. This is performed from the COM card (single access). It allows configuration of:

- ☐ The parameters of the CPU card (date, fault detection, etc.).
- ☐ The parameters of the Communication card (com. parameters, alarms, etc.).
- ☐ The system parameters (variable management, class management, etc.).

Equipment required for T200 connection

For testing-maintenance configuration, the T200 requires:

- ☐ A microcomputer operating under Windows 2000 or XP exclusively and including *Internet Explorer* (version 5.5 or 6.0).
- ☐ An USB port on this PC to perform connection with the T200.

An Ethernet port (RJ45) is available on the COM card for remote access to the T200 from an Ethernet network.

This port can also be used for direct connection of the T200 with the PC.

The Ethernet cable required for Ethernet network-T200 connection or PC-Ethernet network connection is of the "straight-through" type.

The Ethernet cable required for PC-T200 connection is of the "cross-over" type.

The USB cable required for PC-T200 connection is of the USB-A type at one end and USB-B at the other.

A CD-ROM is supplied to the user for:

- ☐ Installation of the USB driver for connection with the T200.
- ☐ Installation of *Java Runtime Environment 5.0* needed for port trace operation (Supervisor-T200 frame analysis).

⚠ NB: TCP/IP ports 1168, 1169 and 1170 must be accessible on the PC for trace operation. Contact the network administrator if it is necessary to alter the PC or network configuration to deactivate the firewall on these ports.

Configuration of the T200 is performed directly from *Internet Explorer*.

No other additional software is needed to access the T200 testing-maintenance configuration operations (apart from *Java Runtime 1.5*).

Principle of the T200 embedded server

The T200 includes an embedded server which is initialized automatically as soon as connection is established with the T200.

The data displayed by the T200 through this embedded server appears in the form of HTML pages.

Various pages and sub-pages can be accessed by the user depending on the rights available to him. The HTML pages displaying the information managed by the T200 are refreshed in real time so as to update the latest states.

Access and connection are secured by a Login and password. Several levels of access to the HTML pages can be configured, provided one have the required rights.

From the embedded server, it is possible to:

- ☐ Configure the fault detector, communications and automatic control parameters or system parameters (management of variables, classes, rights, etc.);
- ☐ View the states managed by the T200 (TSS, TSD, routine faults, telemeasurements, etc.);
- ☐ Save or load the T200 parameter configuration from files already backed up on the PC;
- ☐ Send remote control orders to the T200;
- ☐ Transfer diagnostic logs in the form of Excel-compatible files;
- ☐ Load a new software version of the T200 application.

The embedded server can be accessed both by the USB port and by the Ethernet port. There is no difference in operation according to the type of port used.

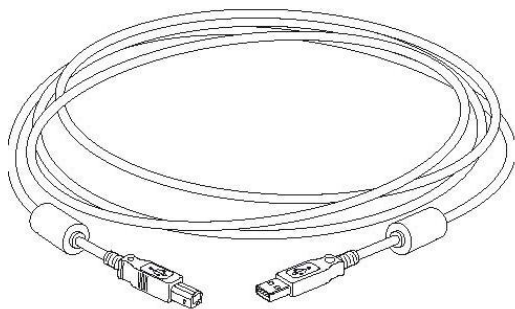
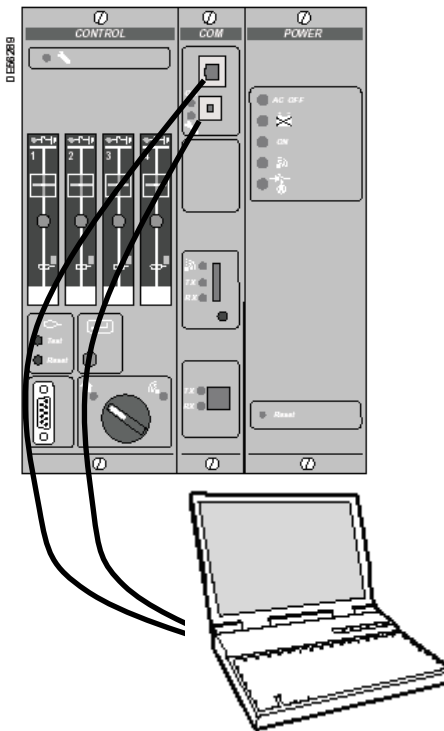
Initialization of connection to the T200

The T200 incorporates by default IP addresses necessary for local connection from a PC. It is important to know these addresses in advance in order to start a connection (these addresses are indicated on the Com card):

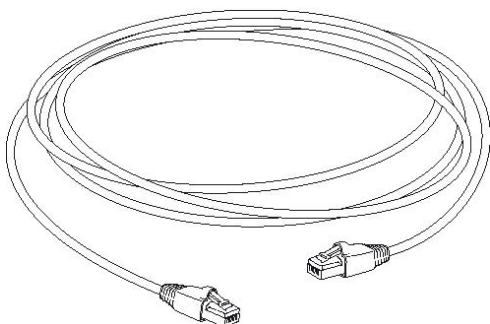
- ☐ USB port: default address on the T200 = **212.1.1.10**
- ☐ Ethernet port: default address on the T200 = **172.16.0.5**

Note: The USB address cannot be modified by the user. The Ethernet address, on the other hand, can be modified (if the rights so permit) so as to correspond to the local area network, which does not necessarily use the same network addresses and masks.

For the T200 link via Ethernet, steps 2 and 3 are not necessary. In that case, go directly to step 5.



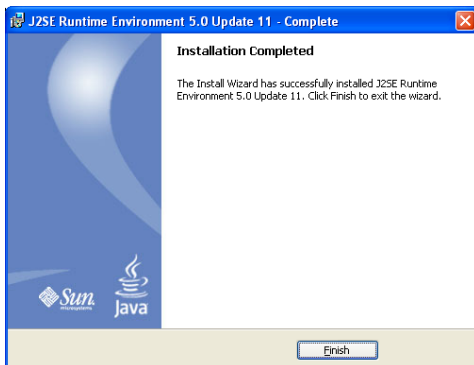
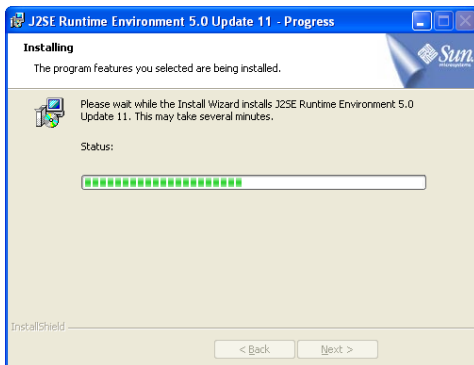
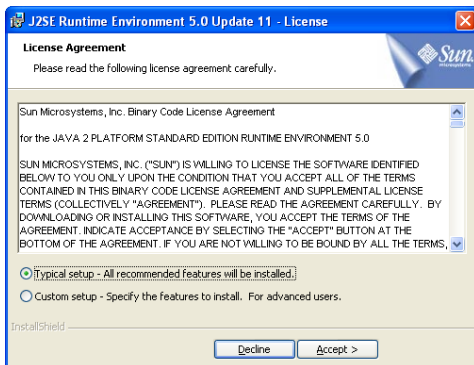
Type B connector Type A connector
USB cable

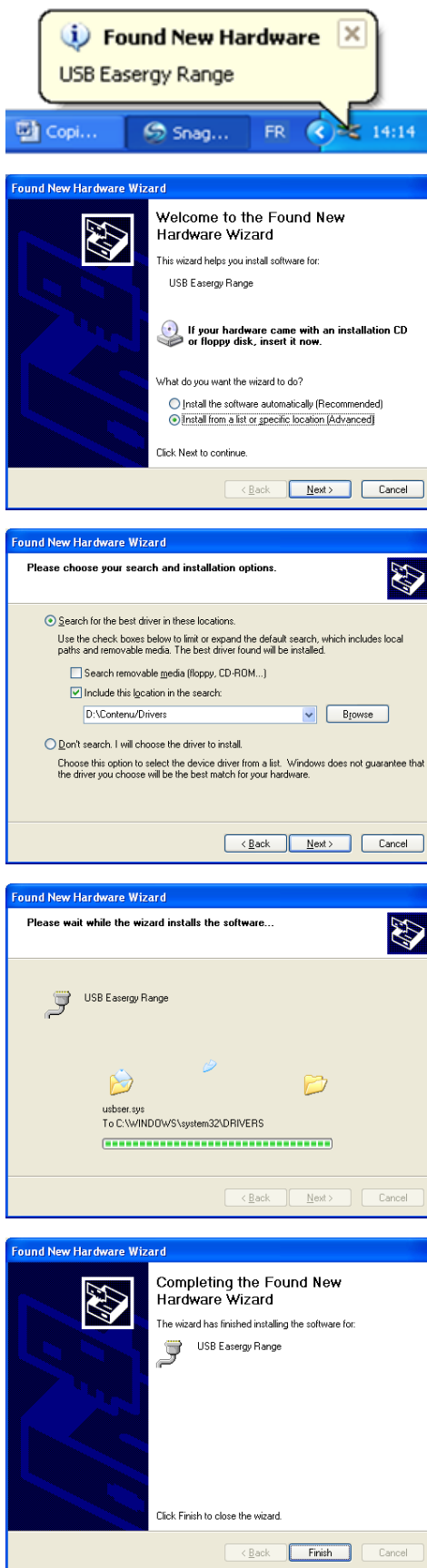


"Cross-over" or "straight-through" Ethernet cable
depending on type of link access

3.1 Step 1 - Installing Java Runtime Environment 5.0

- Insert the CD-ROM supplied with the T200 into the PC drive, then double-click on the "jre-1_5_0_11-windows-i586-p-s.exe" installation file on the CD-ROM (in folder : "D:\Tools\Java").
- Software installation begins; click on the "Standard installation..." option and then on "Accept".
- If new screen including Google options installation, deselect the two proposed options "Google Toolbar" and "Google Desktop", then click on "Next".
- Wait until installation is completed, then click on "Terminate".





3.2 Step 2 - Installing the USB driver

At first connection with the T200 via the USB port, Windows detects the new hardware and asks you to install the driver.

Carry out the following operations to install the USB driver:

Under Windows 2000

- Select the option "Search for an appropriate driver...".
 - Select the option "Specific location".
 - Then indicate "D:\Content\Drivers" as the corresponding driver access path in the search location.
 - Insert the CD-ROM supplied with the T200, then click on "Next".
 - Windows detects the driver. Continue with installation.
 - Driver installation then takes place automatically and ends with the appearance of an "Installation Completed - USB Easergy range" screen.
- The driver is installed.

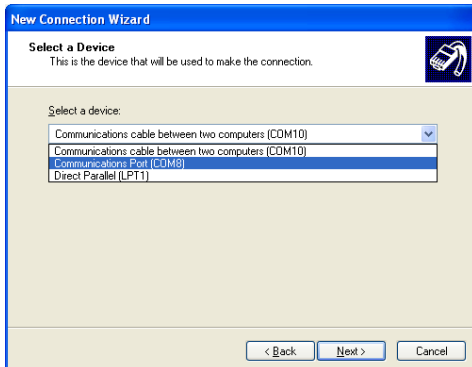
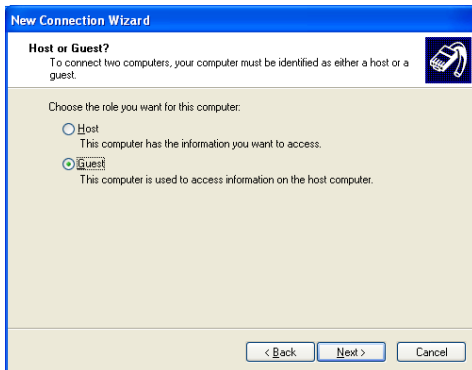
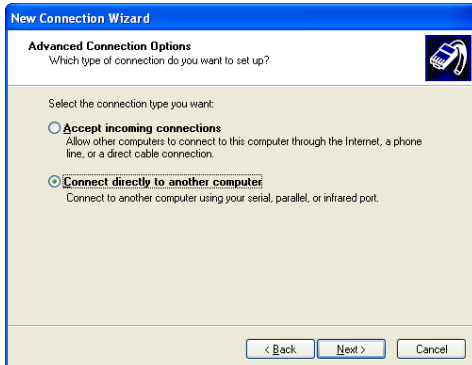
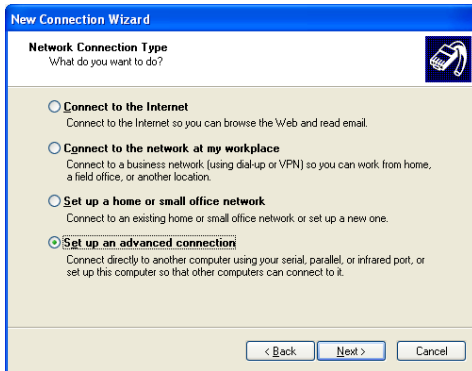
Under Windows XP

- Do not authorize Windows to connect to "Windows Update".
- Select the option "Install from a list or a specified location...".
- Select the option "Search for the best driver in this location" and check the option "Include this location in the search".
- Then indicate "D:\Content\Drivers" as the corresponding driver access path in the search location.
- Insert the CD-ROM supplied with the T200, then click on "Next".
- Windows automatically detects the "USB Easergy range" driver.
- Windows then indicates that the driver is not validated. Continue with installation.
- Driver installation then takes place automatically and ends with the appearance of an "Installation Completed - USB Easergy range" screen.

The driver is installed.

NB: It is recommended to always use the same USB port on the PC for connection to the T200, to avoid having to reinstall the driver on another port.

Note: Step 2 is no longer necessary after the first connection performed with the T200. In that case, go directly to step 5.



3.3 Step 3 - Creation of the USB local area network connection

Once the USB driver has been installed, a remote network connection must be created for the USB link (this is not necessary for the Ethernet link).

With Windows 2000

- Click on the Windows “Start” button.
- Click on “Settings”.
- Click on “Network connection and remote access”.
- Click on “Establish a new connection”.
- Select the option “Connect directly to another computer”.
- Select the “Guest” option.
- Select the last COM port created on the PC corresponding to “Communication Port (COM X)”.
- Select the option “For all users”.
- Give a name to the USB network connection (e.g. “T200 Connection”).
- When the connection window is displayed on screen, there is no need to give a user name and login password.
- Click on the “Log in” option.
- The USB connection between the PC and the T200 is initialized. A USB connection status icon is then inserted in the Windows toolbar.

It is recommended to create a shortcut for the “T200 Connection” USB network connection (e.g. on the desktop of your PC, in order to be able to call it up again later).

With Windows XP

- Click on the Windows “Start” button.
- Click on “Control Panel”.
- Click on “Network connections”.
- Click on “Create a new connection”.
- Select the option “Set up an advanced connection”.
- Select the option “Connect directly to another computer”.
- Select the “Guest” option.
- Give a name to the USB network connection (e.g. “T200 Connection”).
- Select the last COM port created on the PC corresponding to “Communications Port (COM X)”.
- Select the option “All users”.
- Click on “Add a shortcut to this connection to my desktop”, then on “Terminate”.
- When the connection window is displayed on screen, there is no need to give a user name and login password.
- Click on the “Log in” option.
- The USB connection between the PC and the T200 is initialized. A USB connection status icon is then inserted in the Windows toolbar.

Note: Step 3 is no longer necessary after the first connection performed with the T200. In that case, go directly to step 5.

3.4 Step 4 – Creation of the PSTN or GSM remote network connection

This step is to be taken into account only if the T200 includes a GSM or PSTN (telephone) internal modem installed on the COM card.

This connection may possibly operate with an external PSTN or GSM modem, but that depends on the modem used.

Note: It is not necessary to create this type of connection for the GPRS link.

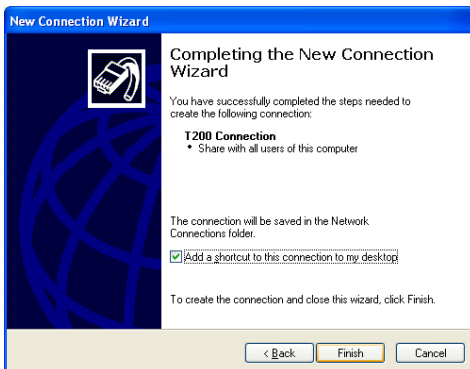
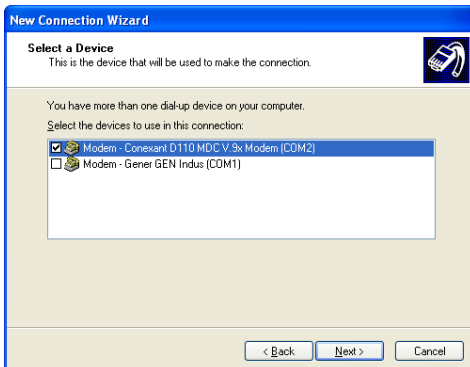
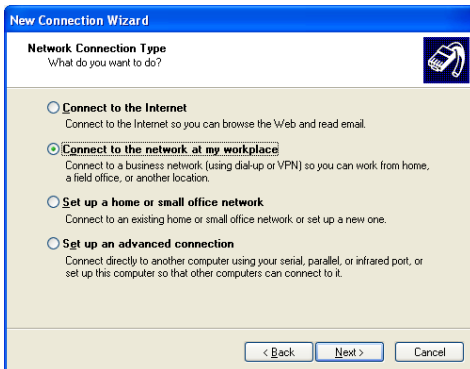
With Windows 2000

- Click on the Windows “Start” button.
- Click on “Settings”.
- Click on “Network connection and remote access”.
- Click on “Establish a new connection”.
- Click on “Connection to a private network”.
- From the list of peripherals displayed, select that corresponding to the modem to be used for connection, by checking it.
- Enter the phone number of the T200 to be contacted (this number may be changed later, at each connection attempt).
- Select the option “For all users”.
- Give a name to the telephone connection to the T200 (e.g. “T200 remote connection”).
- When the connection window is displayed on screen, there is no need to give a user name and login password, and if necessary change the phone number of the T200 to be contacted.
- Click on the “Dial” option.
- The PSTN or GSM remote network connection between the PC and the T200 is initialized between the two devices, then a modem connection status icon is inserted in the Windows toolbar.

With Windows XP

- Click on the Windows “Start” button.
- Click on “Control Panel”.
- Click on “Network connections”.
- Click on “Create a new connection”.
- Select the option “Connect to the network at my workplace”.
- Select the option “Dial-up connection”.
- From the list of peripherals displayed, select that corresponding to the modem to be used for telephone connection to the T200, by checking it.
- Give a name to the telephone connection created (e.g. “T200 remote connection”).
- Enter the phone number of the T200 to be contacted (this number may be changed later, at each connection attempt).
- Select the option “Do not use my smart card”.
- Select the option “All users”.
- Check the option “Add a shortcut to this connection to my desktop”, then on “Terminate”.
- When the connection window is displayed on screen, there is no need to give a user name and login password, and if necessary change the phone number of the T200 to be contacted.
- Click on the option “Dial number”.
- The PSTN or GSM remote network connection between the PC and the T200 is initialized between the two devices, then a modem connection status icon is inserted in the Windows toolbar.

Note: Step 4 is no longer necessary after the first connection performed with the T200. In that case, go directly to step 5.



3.5 Step 5 – Starting connection with the T200

3.5.1 Local access via the USB port of the T200

- The T200 being powered up without a “Fault” indicator lamp lit on the COM card, connect the USB cable to the PC and to the COM card.
- Start the USB remote network connection created earlier (=> step 3).
- Click on “Connect”, and connection is established.
- Start *Internet Explorer*.
- Enter the IP address (212.1.1.10) in the “Address” field, then click on “OK”.
- The home page of the embedded server appears on screen.
- Define the language to be used.
- Enter a “User name” and a “Password” (by default: “Easergy”, “Easergy”), then click on “Ok”.
- Access to the HTML pages is activated according to the rights related to this user.

IMPORTANT NOTE: After powering up or a Reset of the T200, it is important to wait for completion of initialization of the COM card before connecting the USB cable, otherwise the connection is likely not to work. When the T200 is powered up, the red “Fault” indicator lamp should flash for approximately 5 s and then stay lit steadily for 1 s before going out. Only then is connection of the USB cable possible.

Note: To stop the USB connection to the T200, the following operations should be performed (in the respective order):

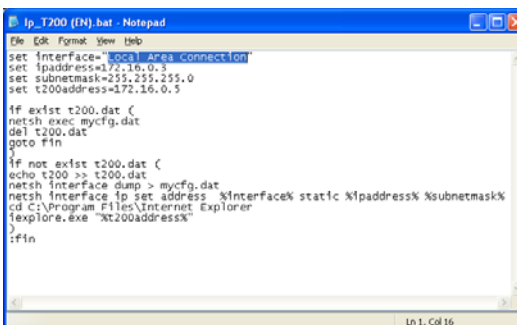
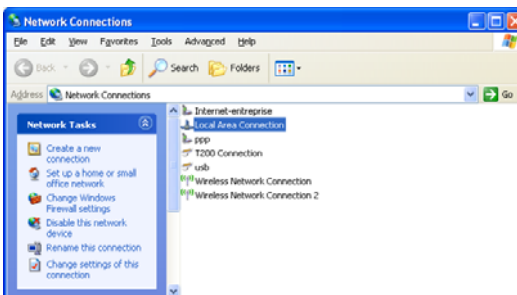
- Stop the T200 connection by double-clicking on the “T200 Connection” shortcut on the PC desktop, then click on the “Disconnect” option.
- Then disconnect the USB cable from the PC and the T200.

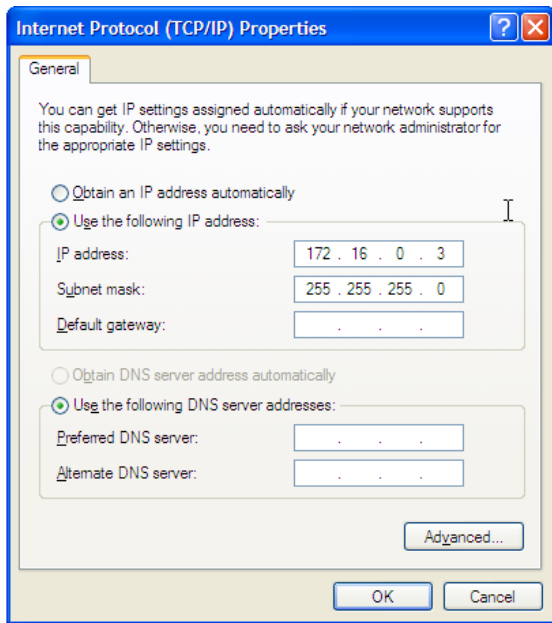
3.5.2 Local access via the Ethernet port of the T200

- With the T200 powered up, connect the PC to the Ethernet connector of the COM card on the T200 using the appropriate cable (cross-over cable).
- Open the Windows “Control Panel”, then open “Network connections”.
- Note the name marked in the “Name” column corresponding to the “Local Area Connection” in the “Type” column.
- Insert the CD-ROM supplied with the T200 into the PC drive.
- Copy the file “Ip_T200.bat” onto the hard disk of your PC (e.g. to C:\).
- Open the file “Ip_T200.bat” on C:, using the Windows *Notepad*.
- Recopy the name of the network connection (noted previously) in the “Ip_T200.bat” file, following the “set interface=” indication.
- Save the file, then double-click on the file “Ip_T200.bat”.
- Internet Explorer starts with the T200 automatic connection, reallocating the PC’s Ethernet connection parameters for correct operation of the connection with the T200.
- The home page of the embedded server appears on screen.
- Define the language to be used.
- Enter a “User name” and a “Password” (by default: “Easergy”, “Easergy”), then click on “Ok”.
- Access to the HTML pages is then activated according to the rights related to this user.

Note: The Windows “Notepad” does not manage accented characters. Accordingly, if the name of the Windows local area connection contains accented characters, this connection should be renamed in Windows and in the file “IP_T200.bat”, to replace the accented characters with non-accented characters.

IMPORTANT NOTE: Once connection with the T200 is completed, you should click again on the file “Ip_T200.bat” to retrieve the previous PC settings concerning the Ethernet connection.





Another method:

- In the Windows Control Panel, click with the right mouse button on "Connection to local area network" to be found in the "Network Connections" directory.
- Click on the "Internet Protocol (TCP/IP)" item, then on the "Properties" button.
- Then check the "Use the following IP address" option and then manually enter the following items:
 - IP address = "172.16.0.3"
 - Subnet mask = "255.255.255.0".
- Click on the "Ok" button to accept the settings.
- Start *Internet Explorer*.
- Enter the IP address (172.16.0.5) in the "Address" field, then click on "Ok".
- The home page of the embedded server appears on screen.
- Define the language to be used.
- Enter a "User name" and a "Password" (by default: "Easergy", "Easergy"), then click on "Ok".
- Access to the HTML pages is activated according to the rights related to this user.

IMPORTANT NOTE: Once connection with the T200 is completed, you should restore the original IP address configuration settings of the PC.

3.5.3 Remote access via a local Ethernet network (LAN) or a GPRS network

- With the T200 powered up, connect the PC and the T200 to the local Ethernet network (LAN) using appropriate cables (straight Ethernet cables).
- Start *Internet Explorer*.
- Enter the IP address of the T200 corresponding to the Ethernet or GPRS access in the "Address" field, then click on "Ok".
- The home page of the embedded server appears on screen.
- Define the language to be used.
- Enter a "User name" and a "Password" (by default: "Easergy", "Easergy"), then click on "Ok".
- Access to the HTML pages is then activated according to the rights related to this user.

Note: Generally the default IP address of the T200 cannot be used on the Ethernet or GPRS network employed, and it must therefore be replaced, in the T200's specific IP address configuration page, with an address acceptable for the network (see section on IP address configuration). In that case, the only way to access the T200's IP address configuration page is to use the USB local connection.

Note 2: Unlike Ethernet access, the connection speed on a GPRS link is relatively slow (max. connection speed = 57600 baud). Accordingly, so that the display of data on screen may be slowed as little as possible, following a GPRS connection the T200 automatically displays the pages of the Web server in simplified mode (Web server configuration in "Remote" mode). However, it is possible to return to a standard display by clicking on "Local" configuration, at the top of the Web server home page.

3.5.4 Remote access via telephone or GSM link

This access operates only when the T200 includes a GSM or PSTN (telephone) internal modem installed on the COM card.

When an external modem is used, it is possible that this access may operate, but that depends on the modem used.

- Start the GSM-PSTN remote network connection created previously (=> step 4).
- Click on *"Dial number"* to start remote network connection.
- Once connection is established, start *Internet Explorer*.
- In the address field of Internet Explorer, enter one of the following IP addresses, depending on the port No. on which the RTC or GSM modem is installed on the T200:
 - For port 1: 212.1.0.1
 - For port 2: 212.1.0.3
- The home page of the embedded server then appears on screen.
- Define the language to be used.
- Enter a *"User name"* and a *"Password"* (by default: *"Easergy"*, *"Easergy"*), then click on *"Ok"*.
- Access to the HTML pages is activated according to the rights related to this user.

Note: Unlike a standard USB or Ethernet access, the connection speed on a telephone link is rather slow (9600 baud).

Accordingly, so that the display of data on screen may be slowed as little as possible, following a PSTN or GSM connection the T200 automatically displays the pages of the Web server in simplified mode (Web server configuration in "Remote" mode).

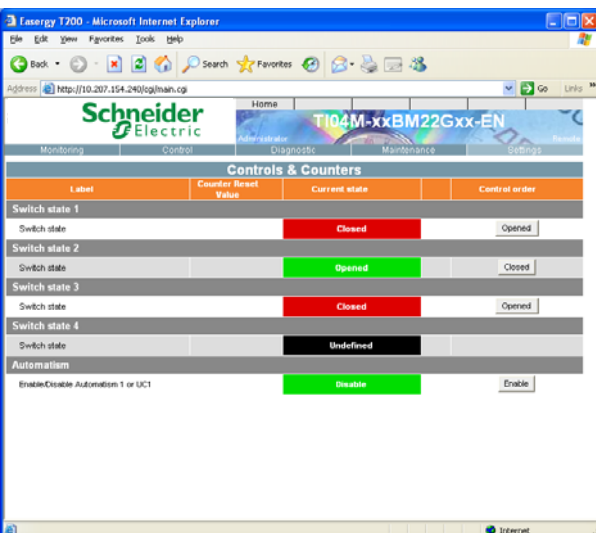
However, it is possible to return to a standard display by clicking on "Local" configuration, at the top of the Web server home page.



Home Page



Monitoring Page



Control Page

3.6 Overview of the embedded Web server of the T200

Once access to the embedded server has been identified by user name and password, all the HTML pages can be consulted by simply clicking on the tabs or the associated drop-down lists when they are available:

Details of the settings for each page are given in Appendix A.

Home Page:

This page is displayed at connection to the T200. It enables definition of the language to be used for displaying the pages. It also allows definition of user access rights by user name and password.

The users and passwords that can be accessed depend on the configuration defined in the **Maintenance** page and the **Users** sub-menu.

By default, the "Easergy" user and "Easergy" password allow access as "Administrator" to the embedded server.

A wrong user or password automatically opens access in "Monitoring" mode.

A click on the "Remote" option at the top of the page makes it possible to log on to the T200 Web server with a simplified display of information (without images or logos) so as to optimize data transfer times. This mode is used automatically for slow remote network connections (PSTN or GSM at 9.6 Kbits/s).

A click on the "Local" button at the top of the page makes it possible to log on to the T200 Web server with a normal display (all logos and images are transferred and displayed). This mode is used automatically for high-speed local area connections: USB (115.2 Kbits/s) or Ethernet (100 Mbits/s).

Monitoring Page:

This page can be used to consult the T200 states:

- ☐ TSS: State of digital inputs, T200 internal faults, voltage presences, current faults, etc.
- ☐ TSD: Open or closed state of switch, automatic control, digital outputs
- ☐ TM: Current measurements.

The page is displayed by class (e.g. *Channel 1*, *Common*, *Automatic control*, etc.).

Each class covers a category of information so as to facilitate viewing on screen.

The states of the indications or measurements are refreshed automatically every second.

Control Page:

This page allows local control orders to be sent from the PC to:

- the switches (change of position by CO/CF);
- the automatic controls (switching ON/OFF);
- the fault detector (fault memory resetting).

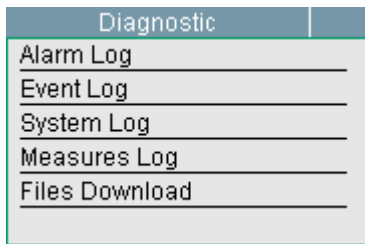
The controls on the TSDs make it possible to go to the state complementing that displayed by the T200.

For safety reasons, each control order must be confirmed by the user.

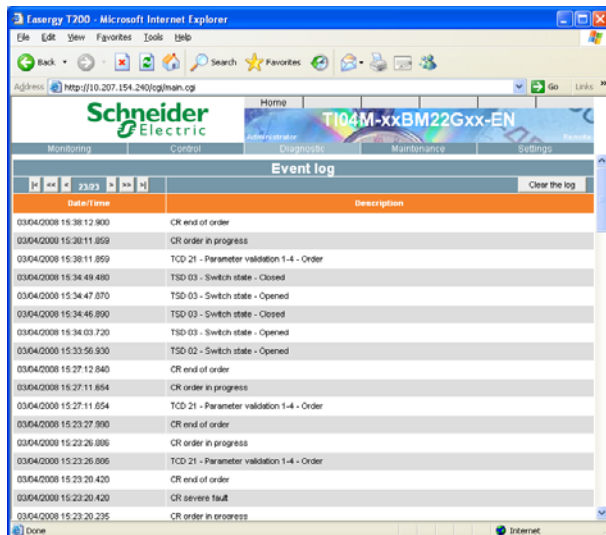
The state of a control order in progress is displayed in orange.

The state of the control order is refreshed on screen automatically as soon as it is completed.

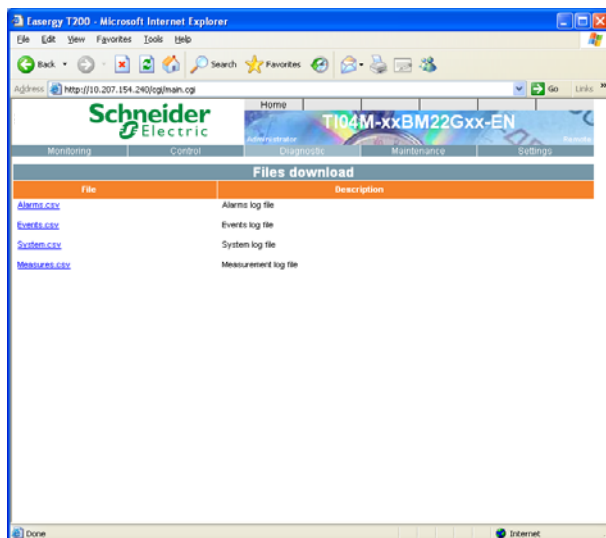
Note: The colours of the states displayed can be modified by configuration.



Drop-down list – Diagnostic page



Event log - Diagnostic page



Files download – Diagnostic page

Diagnostic Pages:

These pages allow consultation of the logs recorded in real time by the T200. The event time stamping is 1 ms.

Each log allows consultation of the history of states occurring on the T200 with a description of the states.

All the information present in the logs is time-and-date stamped by the T200's internal clock.

The logs are as follows:

•Alarm log: (storage capacity: 2000)

Alarms can be generated and transmitted spontaneously to the control centre after an information change of state, provided that this state has been configured as alarmed.

A box associated with each alarm is checked when the control centre has acknowledged this alarm.

Note: Information configured as alarmed automatically implies the generation of an associated event (in the event log or measures log depending on type).

•Event log: (storage capacity: 10000)

Every change of state generates an event, provided that the use of events for this state has been configured.

•System log: (storage capacity: 6000)

The equipment also incorporates a function for recording additional information to facilitate operation and maintenance.

- Storage of transmission events (to determine the origin of a recurring communication fault);
- Indication of transmission errors (CRC error, collisions, PSTN line out of order, switchover to redundancy, etc.);
- Indication of system events (T200 start-up, T200 reset, change of configuration, etc.).

•Measures log: (storage capacity: 30000)

The measurements managed by the T200 (phase current or mains voltage) can be saved in a log, provided that their use has been configured.

The measurements can be recorded in several ways:

- Periodically (sampled or averaged value with configurable period);
- Upon exceeding a threshold (configurable high or low threshold);
- Upon variation or "dead band" (configurable variation %);
- Upon periodic recording of Min. and Max. values (configurable values and period).

For all the logs, when the storage capacity is reached, the most recent event occurring erases the oldest event on the list.

•A Files download sub-menu allows these logs to be saved to the PC in the form of Excel-compatible files (*.csv files).

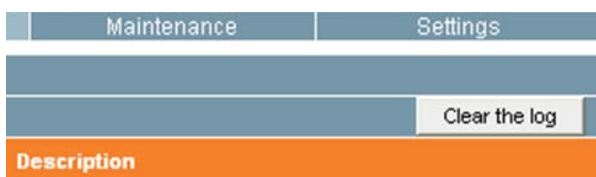
These files can be consulted or transferred, to enable the establishment of statistics or reviews.

An "Empty log" button in each log can be used to empty their content, i.e. to erase all the information saved previously.

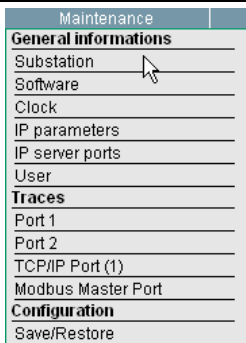
Principle of saving to logs:

To increase the life of the flash memory, saving to the logs is performed every 5 min.

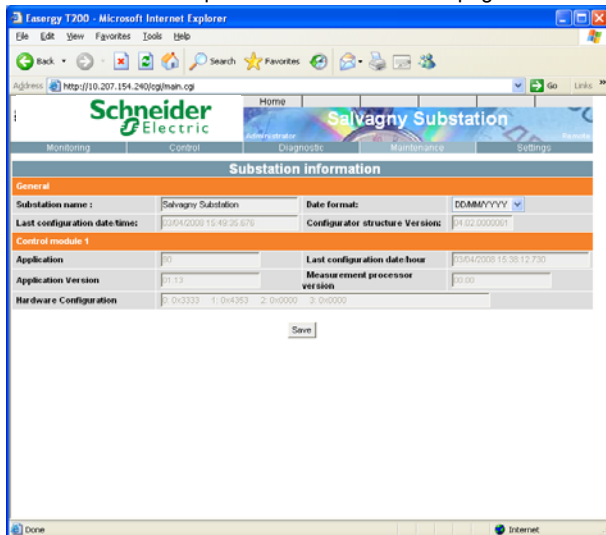
Accordingly, when a reset is performed on the T200, it is possible that the most recent events that have occurred since the last backup may not be saved in the logs. The only exception is when imminent cut-out occurs on the enclosure. In that case, even if the time elapsed is less than 5 min., the T200 saves the events to the logs before cutting off the power supply.



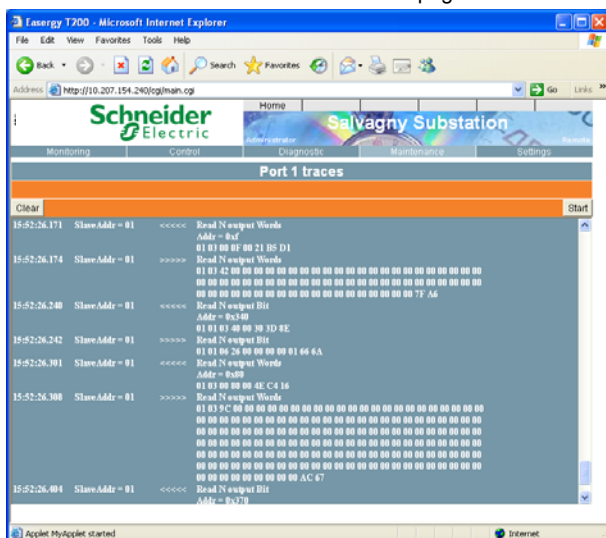
Connection to the T200 Overview of the Web server



Drop-down list – Maintenance page



Substation information – Maintenance page



Port trace – Maintenance page



Saving/backup – Maintenance page

Maintenance Pages:

Several pages can facilitate maintenance of the T200, by giving information or allowing configuration of the T200 application:

1. **General information:** Specific sub-pages provide information concerning the T200 application, namely:

- **Substation** page: information concerning the current application (version No. of the application and fault detector, date and time of last configuration, name of substation, etc.).
- **Software** page: information concerning the software used by the T200 (version, date and time of compilation, size and CRC32). The T200 is capable of storing two different software versions in memory. It is possible to switch from one software version to another simply by selection (if two versions are available). It is also possible to load a new software version from a file available on the PC or from a floppy disk or CD-ROM.
Note: When loading a software on the T200, one in fact loads the protocol used for remote transmission but also all the equipment operating options, including some that are managed and displayed by the Web server if configured and/or detected physically on the COM card, namely:
 - The Modbus master function
 - The function of synchronization by GPS
 - The digital input counting function.

- **Clock** page: Allows the T200 date and time to be configured manually or automatically from the time on the PC. A click on the "Update" button causes the manual change of date and time to be accepted. A click on the "Synchronization" button allows the PC date and time to be taken into account automatically for configuration on the T200.
Comment: This configuration is possible only if synchronization by SNTP server or by GPS module is not installed in the T200.

- **IP parameters** page: Allows consultation or where applicable configuration of the Ethernet and USB interface parameters (IP addresses, sub-network masks, etc.). When a GPRS modem is installed on the COM card, this page also allows consultation of the IP addresses assigned automatically by the GPRS server.
NB: It is dangerous to modify the Ethernet IP parameters, with a risk of no longer being able to access the T200. Call on competent authorities to modify these parameters.

- **IP server ports** page: allows redefinition of the port numbers used by the T200 for COM card access, in the event that the transmission network does not accept the default numbers (e.g. restriction on certain GPRS operators).
By default, the following port Nos. are configured on the T200:

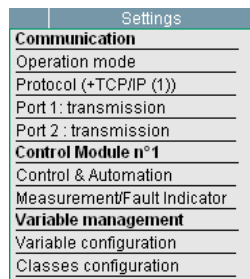
- HTTP server port = 80
- Telnet server port = 23
- Port 1 trace server port = 1168
- Port 2 trace server port = 1169
- TCP/IP port trace server port = 1170

This page is optional depending on the embedded software in the T200 (e.g. present page for software including GPRS transmission).

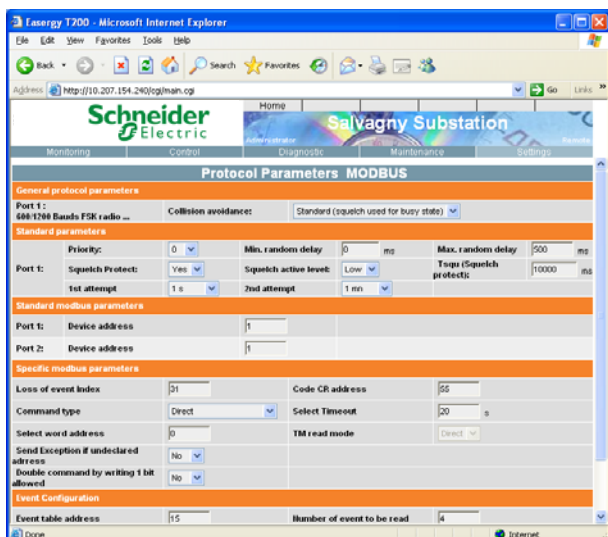
NB: If the HTTP port number is changed in this page, to be able to log on to the T200 Web server again, it is **essential** to add the port number at the end of the T200's IP address preceded by a colon (e.g. 10.207.154.239:1500 for a T200 access on port 1500).

- **User** page: Allows creation, modification or deletion of users and management of rights (login, password, access rights).
2. **Port 1 & 2 & TCP/IP traces:** A page allows viewing of communication exchanges between the control centre and the T200, for each port available (hexadecimal frames).
This trace is displayed on screen in decoded form to facilitate reading of the frame's content:
 - **Column 1:** frame time-and-date stamping (in hour:minute:second.thousandth of second format).
 - **Column 2:** direction of dialogue, RTU -> PC or PC -> RTU, with associated address Nos of the PC and RTU.
 - **Column 3:** hexadecimal frame + brief description of the content of the frame.

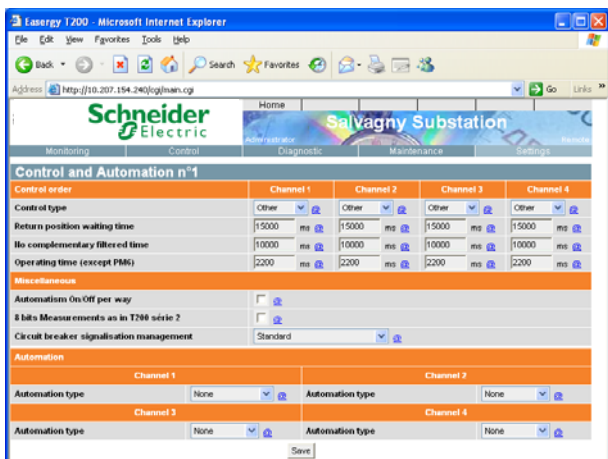
Connection to the T200 Overview of the Web server



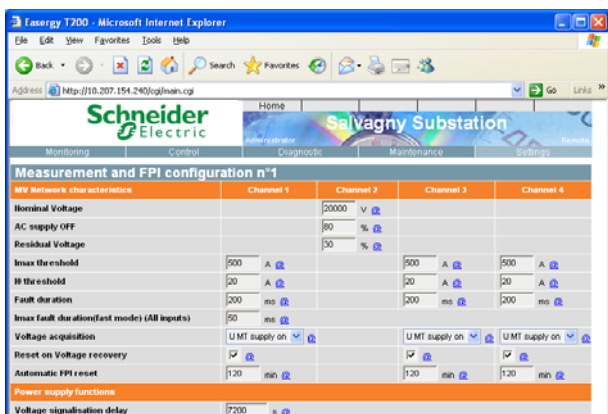
Drop-down list – Settings page



Protocol parameters – Settings page



Control and automation – Settings page



Measurements and fault detection – Settings page

3. Configuration:

- **Save/Restore** page: Allows all the current T200 configuration parameters to be saved to a file.

It is also possible to load from a file available on your PC or from a floppy disk or CD-ROM the T200 configuration parameters coming from a preceding backup or coming from another substation.

This file can be used to configure one or more other substations in the same way without being obliged to reconfigure all the parameters one by one.

Note: During loading from a file, the data integrity is verified automatically so as to ensure the compatibility of application versions.

Settings Pages

Configuration of the T200 is performed from pages grouped together in several different categories:

1. Communication:

Several pages allow you to configure the specific communication parameters of the T200:

- **Operation Mode** page: For each communication port available on the T200, it is possible to determine:

- The protocol available;
- The type of transmission medium to be used (Radio, PSTN, GSM, etc.);
- The way in which the ports will be managed according to one of the available modes:

- ☐ Not used
- ☐ Normal
- ☐ Duplicate
- ☐ Balanced – Normal/Backup
- ☐ Main – Normal/Backup
- ☐ Backup – Normal/Backup
- ☐ Repeater

- **Protocol + TCP/IP Protocol** pages: These pages are used to configure the parameters specific to the protocol used:

- ☐ Max. number of send operations
- ☐ Collision avoidance system;
- ☐ Configuration of link addresses;
- ☐ Frame size;
- ☐ etc.

Note: Each type of protocol has its specific configuration page. For more details, refer to the specific user manual for the protocol installed on the T200.

- **Ports 1 & 2 transmission** page: This page is used to configure the parameters of the communication port (modem):

- ☐ Baud rate (e.g. 19200 baud);
- ☐ Parity, stop bit, etc.;
- ☐ Time-out management (e.g. RTS-CTS, CTS-message, etc.);
- ☐ etc.

Note: The parameters displayed in this page depend on the type of transmission medium configured in the **Operating modes** page.

2. Control Module No. x:

Some parameters of the T200 are managed for each Control module of the T200. Two pages allow this configuration:

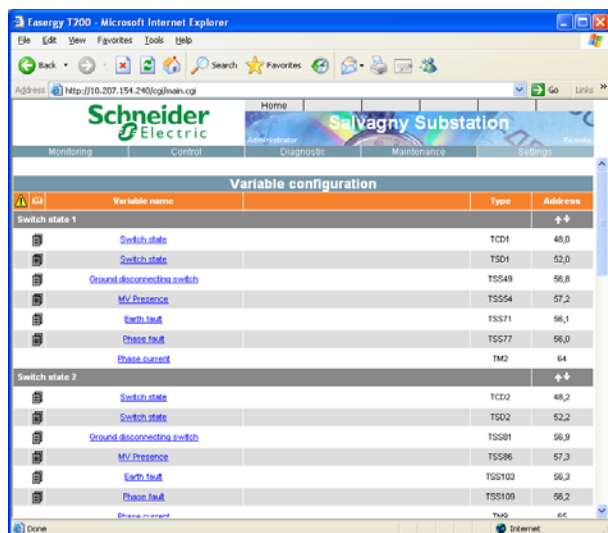
- **Control and Automation** page: This page can be used to configure the parameters related to electrical control of the switch and automation management:

- ☐ Type of switch (Standard, PM6, CI2 or other);
- ☐ Change-of-position waiting time;
- ☐ Type of automatic control;
- ☐ etc.

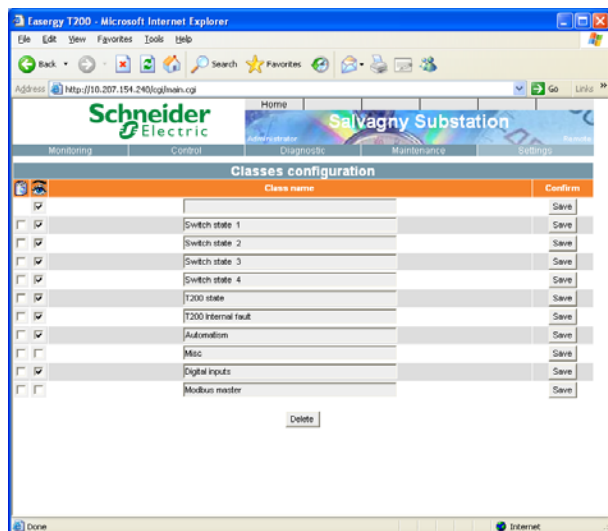
- **Measurements and fault detection** page: This page allows configuration of all the T200 analogue information, namely:

- ☐ I_{max} and I₀ threshold;
- ☐ Detector reset time;
- ☐ Time for response to I_{max} and rapid I_{max};
- ☐ Choice of reset upon voltage return.

Connection to the T200 Overview of the Web server



Variable Configuration – Settings page



Classes Configuration – Settings page

| Label | Status |
|-----------------------------|--------|
| Switch state 1 | |
| Switch state | Closed |
| Ground disconnecting switch | Opened |
| MV Presence | No |
| Earth fault | No |
| Phase fault | No |
| Phase current | 0.0 A |

Example of variables associated to a class
Excerpted from the page: "Monitoring"

3. **Variable management:** All the information managed by the T200 must be configured separately to define its operation and how it will be managed by the embedded server:

- **Variable configuration** page: The complete list of information (variables) managed by the T200 is displayed in this page, under various categories.

Depending on the type of variable, the configuration page and the parameters displayed may be different. There is a specific type of page for:

- ☐ Digital control orders (e.g. TCD)
- ☐ Double indications (e.g. TSD)
- ☐ Single indications (e.g. TSS)
- ☐ Analogue measurements (e.g. TM).

The parameters to be configured for each variable are (for example):

- ☐ Variable name
- ☐ Type of access (operator session, administrator session, etc.);
- ☐ Assignment class;
- ☐ Logical, remote and internal addresses;
- ☐ Measurement, event and alarm management;
- ☐ Type of recording for measurements (periodic, upon exceeding high or low threshold, upon % variation or indication of min. and max. values per period);
- ☐ etc.

Note: The parameters to be configured depend on the type of page displayed.

- **Classes Configuration** page: The variables created can be grouped together by classes, so as to facilitate the management and display of variables. Each variable can be assigned to one of these classes by configuration. This page can be used to create, modify or delete the classes managed by the embedded server and determine those that will be visible in the *Monitoring* page.

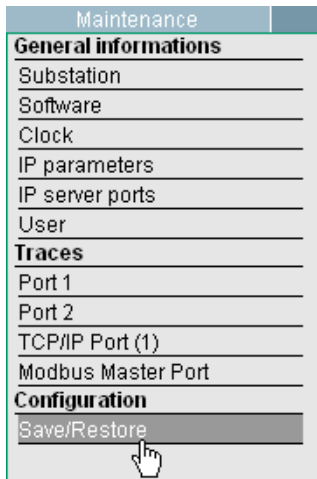
4 T200 Configuration

This chapter aims to provide the user with all the information needed to be able to perform configuration of the T200 data.

Certain complex functions of the T200, in particular, require some detailed explanations (fault detection, automatic control, etc.) for a better understanding of how to configure the T200.

The functions discussed in this chapter are as follows:

- ☐ Backup/Restoral of configuration parameters
- ☐ Configuration of communication with the Supervisor
- ☐ Configuration of switch controls
- ☐ Configuration of the various options
- ☐ Automatic control configuration
- ☐ Configuration of the fault detection module
- ☐ T200 variable configuration
- ☐ Class configuration



4.1 Save/Restore configuration parameters

Access: **"Maintenance/Save-Restore"** page.

The T200 can save in file form all the configurable parameters of the equipment (except the parameters of the *"IP parameters"* page which remain specific to each equipment item).

This file can then be used for downloading to other equipment of the same type, thus enabling the T200 to be configured automatically without needing to redo the entire configuration manually, which would be rather onerous.

However, the parameters specific to each T200 must then be personalized (e.g. protocol address, fault detection thresholds, etc.).

The *"Maintenance/Backup-Restore"* page provides access to backup/restoral resources.

❑ Saving the configuration on PC:

This section describes saving of the T200 configuration in file form (T200 → PC direction).

There are two possible backup file formats:

- **Zipped text file**: Click once on the arrow (T200 → PC) and the T200 automatically creates a compressed text file (file with *.zip extension) containing the T200 parameters.

- **Binary file**: Click once on the *"Binary file"* link and the T200 automatically creates a binary file (file without extension) containing the T200 parameters.

Note: There is in theory no need to use the binary format for backup, except if you want to generate a backup compatible with an old software version of the T200 (see chapter below: *"Backup file compatibility"*).

❑ Downloading the configuration from the PC:

This section describes downloading to the T200 the parameters contained in a backup file (PC → T200 direction).

In this mode there is only a single button for downloading.

The T200 automatically detects the type of file downloaded and manages the reading of information accordingly.

It is possible to download three types of files:

- ❑ Text file (extension: *.txt)
- ❑ Binary file (without extension)
- ❑ Compressed text file (*.zip extension).

❑ Backup file compatibility:

In the first T200 software versions (versions below V2.50 or V3.50), backup and restoral was possible only in a single type of file format (binary file).

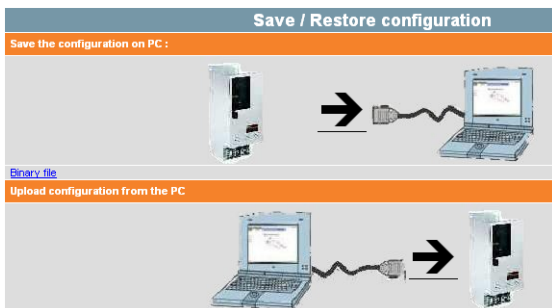
To be able to load these old backup files on a recent T200, it is essential that the T200 include a V2.5x or V3.5x version. A V4.0x version will not allow this type of file to be loaded for reasons of incompatibility.

This is because the V4.0x software versions (versions which include all the recent T200 functionality options) allow loading only of configuration files that have been created using a V2.5x, V3.5x or V4.xx version.

You should therefore proceed in two stages to load a configuration file coming from an old software version on a T200 containing a recent software version of the V4.xx type:

1. Load the old configuration file on equipment incorporating an equivalent software version (e.g. V2.5x for V2.xx versions and V3.5x for V3.xx versions).
2. Save the configuration in file form (choice of format: without extension or *.zip).
3. Load software version V4.xx on this equipment.
4. Load the configuration file saved previously.
5. Save the configuration.
6. The file obtained will then be compatible with recent software (V4.xx, V2.5x or V3.5x).

Note: The file obtained will no longer be compatible with the old software (versions below V2.50 or V3.50). If the software version has not been updated on all the T200's, it is therefore wise to keep both types of backup (old and new).



Backup/Restore page

4.2 Parameters for communication with the supervisor

The COM card of the T200 is designed to detect automatically the type of modem that is installed on the communication ports used for transmission to the SCADA system (ports 1 and 2).

The configuration software automatically proposes a choice of media on these ports which will correspond to the type of modem installed.

The parameters present in the configuration pages for ports 1 and 2 take into account the type of medium that has been selected, because each type of medium has specific configuration parameters.

The configuration page for protocol parameters may take also into account certain parameters related to the type of medium selected.

Comment: The protocol parameters related to the type of medium will be described in this chapter. The other parameters related to the protocol will not be described in detail, however. For more information concerning the latter, refer to the User's Manual for the protocol.

4.2.1 "Operating Mode" page

Access: "Settings/Operating Mode" menu

Objective of this page: Activate the transmission ports and select the type of modem to be used and how it will be managed (up to two communication ports available).

The parameters for this page can be consulted and/or modified depending on the user profile.

- ☐ **Configuration for each port used (Port 1 or Port 2):**
 - ☐ **Mode:** Allows choice (or merely gives an indication depending on the protocol) of the transmission mode used for dialogue with the SCADA system.

Depending on the protocol used, there is a choice between one of the two modes mentioned below. Some protocols are fixed from the transmission mode viewpoint and do not allow this choice. In that case, the T200 proposes merely an indication, with no possibility of modification:

- **Master/Slave:** communicates exclusively in the Scada -> T200 direction. No remote alarm function used in this mode.

Depending on the protocol, the exact title displayed may be:

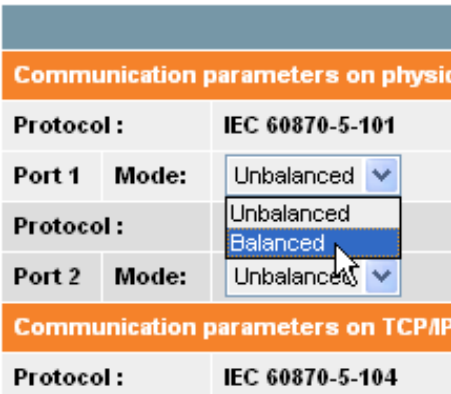
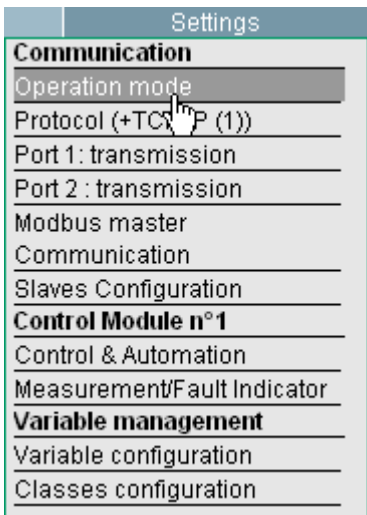
- ☐ "Unbalanced" (e.g. IEC protocol);
- ☐ "Master/Slave" (e.g. PUR protocol);
- ☐ "No report by exception" (e.g. Modbus protocol);
- ☐ "No unsolicited response" (DNP3 protocol).

- **Master/Master:** communicates in both directions, Scada -> T200 and T200 -> Scada. The remote alarm function will be used in this mode if one of the modes mentioned below corresponding to the Master/Master mode is configured. On the other hand, the remote alarm function will not be used if the Master/Slave mode mentioned above is configured.

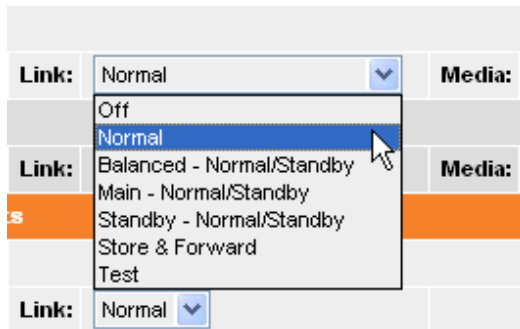
Depending on the protocol, the exact title displayed may be:

- ☐ "Balanced " (e.g. IEC protocol);
- ☐ "Master/Master" (e.g. PUR protocol);
- ☐ "Report by exception" (e.g. Modbus protocol);
- ☐ "Unsolicited response" (e.g. DNP3 protocol).

Comment: The "Report by exception" mode is not really a Master/Master mode. It is in fact a Master/Slave mode with the possibility of alarm sending to the SCADA system by means of the "Report by exception" function, which from the functional viewpoint resembles a Master/Master mode.



Excerpted from the page: "Settings/Operating mode"



from the page: "Settings/Operating mode"

- **Link:** Allows definition of the way in which the ports will be managed according to one of the following modes:

- ☐ **Off:** No transmission over this channel.
- ☐ **Normal:** Main transmission channel to the SCADA system. Two "Normal" channels with the same protocol but with different characteristics (e.g. type of transmission) can be used if there are two remote control systems (main and maintenance). The T200 cannot manage simultaneous remote controls coming from the two systems.
- ☐ **Balanced – Normal/Standby:** Two channels are necessary in this mode. The operation of the channels is symmetric. In the event of a fault on the channel in service, switchover to the other channel takes place automatically.
- ☐ **Main – Normal/ Standby:** Requires another channel as " Standby – Normal/Standby". Same operation as "Balanced" but with priority use of the main channel.
- ☐ **Standby – Normal/ Standby:** Requires another channel as "Main – Normal/Standby". Same operation as "Balanced" but with use of the backup channel if failure of the Main channel. A configurable option can be used to define a priority return to the main channel if the latter becomes available again.
- ☐ **Store & Forward:** Function used mainly in radio mode. In addition to the normal channel function of transmission to the SCADA system, this channel is also used for relaying to an auxiliary T200 located within reach of transmission and which is not accessible by any other means. Upon detecting a message which is not addressed to it, the T200 resends it over the same channel so as to send the message to the relevant T200.
- ☐ **Test:** (in radio mode only). Allows a fixed frequency to be generated on the radio network to allow antenna installation adjustment operations or level measurements on fields received on another T200 within reach of the first.

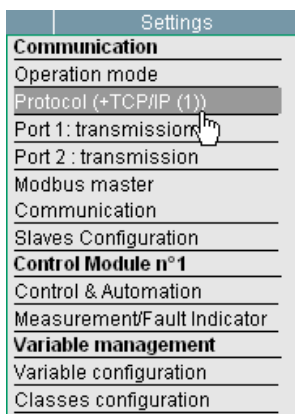
Note: Depending on the protocol, all the operating modes of the ports mentioned above are not necessarily available.

- **Medium:** Allows definition of the type of transmission medium to be used for the link to the SCADA system, for each port. The choice proposed below depends on the type of modem detected on the COM card port, namely:

- ☐ RS232 modem installed on the port:
 - ◆ Direct RS232 (internal interface)
 - ◆ Radio (external with modem)
 - ◆ PSTN (external modem, Hayes command)
 - ◆ GSM (external modem, Hayes command)
 - ◆ PSTN (UMPC and external modem)
- ☐ Radio modem installed on the port:
 - ◆ 1200/2400 baud FFSK radio (internal modem)
 - ◆ 600/1200 baud FSK radio (internal modem)
 - ◆ 600/1200 baud LL radio (internal modem)
- ☐ GSM/GPRS modem installed on the port:
 - ◆ GSM (internal modem)
 - ◆ GPRS (internal modem)
- ☐ PSTN modem installed on the port:
 - ◆ PSTN (internal modem)
- ☐ etc.

Configure the port according to the type of transmission medium wanted based on the proposed choice.

Important note: A medium not configured or incorrectly configured generates a fault on the COM card (red fault indicator lamp lit on the front of the card).



4.2.2 "Protocol" page

Access: "**Settings/Protocol (+TCP/IP (1))**" page.

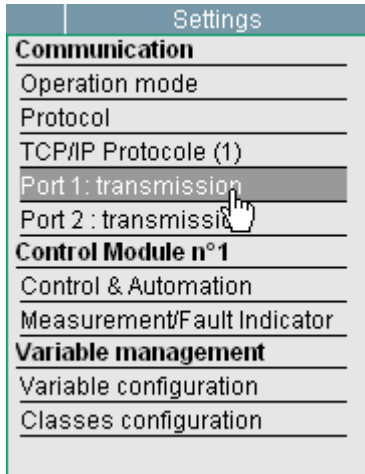
The parameters of this page depend entirely on the type of protocol used. Detailed explanations concerning this page will therefore not be given in this manual.

Refer to the protocol User Manual for details concerning configuration of the parameters of this page.

Note that certain parameters of this page depend on the type of modems installed on the ports.

For example, the "*Collision Avoidance Parameters*" section (see image below) is displayed in this page only when a Radio or PSTN modem (internal or external) is configured on the COM card.

| Protocol Parameters IEC 60870-5-101 | | | | | | |
|---|-------------------------|--|------------------------------|-------------------|----------------------------|----------|
| Interoperability (symmetrical mode) | | | | | | |
| Port 1 : Radio (external with mode... | TL (Timeout Link): | 5 s | Maximum number of emissions: | 3 | | |
| | Station | Type B | Service | Send/Confirmation | | |
| | Collision avoidance: | Standard (squelch used for busy state) | | | | |
| Collision avoidance parameters | | | | | | |
| Port 1: | Priority: | 0 | Min. random delay | 0 ms | Max. random delay | 500 ms |
| | Squelch Protect: | Yes | Squelch active level: | Low | Tsqu (Squelch protect): | 10000 ms |
| | 1st attempt | 1 s | 2nd attempt | 1 mn | | |



4.2.3 "Port 1 (or 2): Transmission" page

Access: **"Settings/Port X: Transmission" page**

The parameters display for this page depends on the type of modem installed on the port of the COM card (port 1 or port 2) and on the transmission medium chosen in the "Settings/Operating Mode" page.

Configuration procedure:

The T200 is factory-delivered with a default configuration corresponding to the type of modem installed on the COM card (internal modem) or on the sliding plate of the enclosure (external modem).

The user should then (if need be) adjust the parameters of this page (in particular the modem management signals and associated time delays) depending on what is required for the modems used or possibly the transmission network.

Concerning the adjustment of transmission delays, in theory one starts by configuring high values for all the delays, checking first that dialogue is established between the T200 and the Supervisor.

One starts by gradually reducing the first time delay in order to determine the operating limit of the modem relative to the adjusted signal.

Then, this delay is increased by several tens of milliseconds to retain a safety margin.

The procedure is then started again with the other delays.

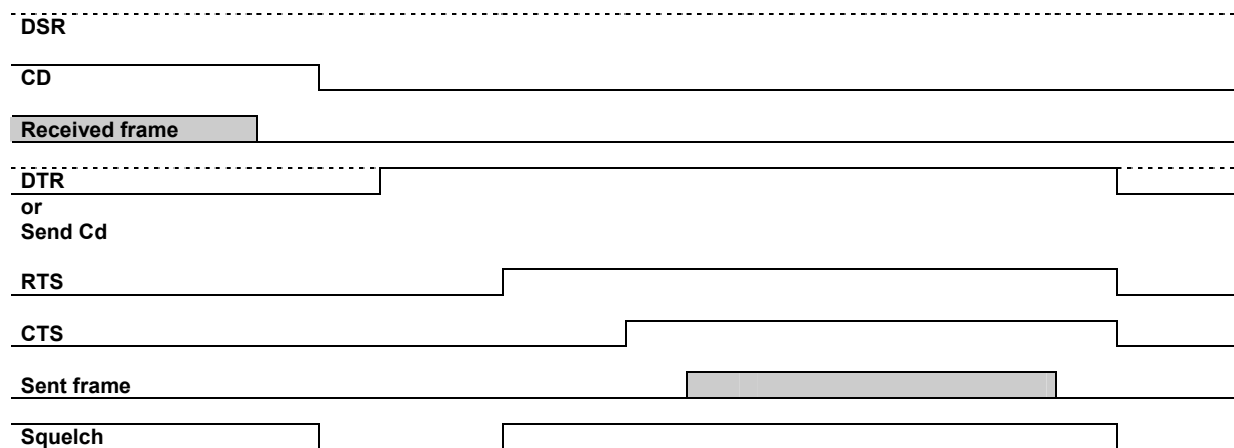
This method allows T200-Supervisor transmission times to be optimized.

In case of doubt concerning the configuration, it is preferable to leave the default values.

Modem management signals:

Before going into detail concerning the parameters to be configured, the function of each modem management signal should be explained.

The following timing diagram shows the management signals involved during communication between the T200 modem and the interface or the external radio, or even directly with the control centre.



DSR (Data Send Ready):

This signal can be supplied to the T200 to indicate that the Control Centre (or the modem) is capable of transmitting (or simply that it is energized).

This signal is used only in the case of an RS232 link (not used in radio mode).

CD (Carrier Detect):

This signal, when it exists, is used to confirm receipt of the received frame. It can also be used to learn the transmission network occupancy.

DTR (Data Terminal Ready):

When the Control Centre uses DSR, DTR is used to indicate that the T200 is ready for transmission (equivalent of DSR but in the other direction).

In radio mode with internal modem: This signal is used by the T200 to actuate radio terminal transition to sending when it requires different commands for transition to sending and carrier sending.

In radio mode with external modem: This signal is generally not used (with some exceptions) because RTS is used as the sole command to cause rising of the send command and cause rising of the carrier.

RTS (Request To Send):

This signal actuates sending of the modem carrier

CTS (Clear To Send):

After the T200 has performed the Request To Send, the sender sometimes takes a certain time to rise in power before being able to send the messages submitted to it. This is especially true for radio equipment. Accordingly, when the equipment is ready to send, it indicates this to the T200 by causing the CTS signal to rise.

Squelch: This signal is used only in radio mode to indicate to the T200 the occupancy state of the radio network.

Definition of modem management signals and time delays:

The T200 allows the user to configure, if necessary, use or not of the modem management signals and the various associated time delays.

We give below the list of configurable options concerning these modem management signals. Configuration is performed in the pages for ports 1 and 2 of the T200 Web server:

| Port 1 : IEC 60870-5-101 | | | |
|------------------------------|--------------------------|-------------------------------|--------------------------|
| Transmission speed: | 1200 ▼ bauds | Parity: | Even ▼ |
| Number of stop bits | 1 ▼ | Frame error on noisy start | Yes ▼ |
| Frame error on idle interval | Yes ▼ | Delay before response | 0 ms |
| Handle DTR | <input type="checkbox"/> | DTR to RTS delay | 0 ms |
| Handle CTS | <input type="checkbox"/> | CTS delay | 20 ms |
| | | RTS (or CTS) to message delay | 400 ms |
| | | Message to RTS delay | 20 ms |
| Handle DSR | <input type="checkbox"/> | Handle DCD | <input type="checkbox"/> |

- **Delay before response:** After receiving a message, this is the waiting time before sending the message (response). This delay serves to avoid any overlapping of signals between the message received and the message sent. This delay is often used with a radio medium or with certain modems which require a time lag to turn around, i.e. a minimum time to go from receive mode to send mode.
- ♦ **DTR management:** If this option is selected, the DTR signal will be managed during transmission exchanges with the modem.
- **DTR - RTS delay (if RTS used):**
- ♦ **RTS management:** If this option is selected, the RTS signal will be managed during transmission exchanges with the modem.
- ♦ **CTS management** If this option is selected, the CTS signal will be managed during transmission exchanges with the modem.
- ♦ **RTS - CTS delay (if CTS used):** This is the maximum time during which the T200 waits for the CTS after the RTS has been activated. If, after this delay, CTS has not become active, the T200 discontinues sending the frame.
- **RTS (or CTS) delay - Message (if RTS or CTS used):** This is the time between transition to the active state of RTS (or CTS if this signal is used) and the start of message sending. Typically this time lag is used to wait for a stable carrier period established by the modem.
If necessary, when CTS is not available, the time for installation of the carrier to solve the problem posed by the non-availability of this signal can be added to this delay. Likewise, if the DTR and RTS commands are common, the time for rise in power of the sender can be added.

Note: Example of delay to be configured on the T200, depending on the type of radio:

- Motorola CM 340 or GM340 radio: RTS-Message delay = 150 ms
- TAIT 811x radio: RTS-Message delay = 100 ms
- MDS4710 radio: RTS-Message delay = 50 ms

- ◆ **Message - RTS delay** (if RTS used): This is the minimum time to be waited, after sending a message, before causing RTS and DTR (or Send command) to fall again. This delay prevents the end of the message from being truncated by the premature fall of modem sending.

Note: Example of delay to be configured on the T200, depending on the type of radio:

- Motorola CM 340 or GM340 radio: Message - RTS delay = 100 ms
- TAIT 811x radio: Message - RTS delay = 80 ms
- MDS4710 radio: Message - RTS delay = 50 ms

- ◆ **DSR management** If this option is selected, the DSR signal will be managed during transmission exchanges with the modem.
- ◆ **CD management:** If this option is selected, the CD signal will be managed during transmission exchanges with the modem.

General parameters (common to the various transmission media):

As a general rule, certain configurable parameters of the ports 1 and 2 pages are common to numerous types of modems. We shall describe in detail here the meaning of these parameters and how to configure them.

- ◆ **Baud rate:** This is the speed of transmission between the T200 and the modem. When an external modem is used, the configured speed is not necessarily the speed that will be used for the link to the Supervisor, because the external modem can use a different speed to that used for the RS232-T200 link.
The choice of available speeds differs depending on the type of modem installed on the ports. Here are a few examples:
 - ☐ FFSK radio: 1200 or 2400 baud
 - ☐ External radio or internal RS232: 200 to 38400 baud
 - ☐ Internal GSM: 600 to 9600 baud
 - ☐ etc.
- ◆ **Parity:** This is the frame character parity for transmission to the Supervisor. Some modems do not manage parity. In such cases, the T200 will have to be configured with the "No parity" option. To be defined therefore according to the type of modem used. Of course, the Control Centre must also be able to be configured in this mode.
Note that when the parity is no longer used, transmission security is diminished and a disturbed frame may be considered correct. (See protocol manual for more details concerning this function).
There are four possible configurations: no parity, space, even or odd.
Note: Parity is not used in PSTN, GSM, GPRS and FFSK radio links.
- ◆ **Number of stop bits:** This is the number of stop bits used to define the end of a frame during transmission.
There are two possible configurations: one or two stop bits.
- **Frame error on idle line:** The T200 is capable of detecting a gap greater than 1 bit between 2 characters of a frame.
With certain protocols, any frame having this feature can be rejected. This allows secure transmission.
This frame rejection will be activated if this option is set to "Yes".
This configuration implies that the Supervisor and the modems involved in the transmission circuit ensure that there are no gaps. While this is sometimes true with regard to the Supervisor, it is not completely true for many modems (case of packet transmission). In this specific case, "No" should be set. However, transmission security must then be ensured by other means (see User Manual of the protocol used for more information).
Note: This parameter is used only on a radio or LL link.
- **Frame error on noisy outgoing cable:** Some transmission networks could constantly generate noise just at the start of frame. In that case this option should be set to "No", to avoid systematically rejecting all the received frames which could be considered incorrect. However, the incorrect character generated by the noise located in the frame header will be eliminated when reading the frame, because this character will not correspond to what is expected by the protocol.
Note that, in most cases, this noise does not exist. In such cases, the option should be set to "Yes".
Note: This parameter is used only on a radio or LL link.

Parameters specific to each transmission medium:

In this chapter we shall describe in detail the configuration parameters specific to each modem (the other parameters having been described in detail in the preceding chapter):

- ❑ **PSTN and GSM medium** (internal or external modem):

| Port 1 : IEC 60870-5-101 | | | |
|---------------------------------------|--------------|----------------------------|-------------------------------------|
| PSTN (external modem, Hayes commands) | | | |
| Transmission speed: | 9600 ▼ bauds | Parity: | No parity ▼ Number of stop bits 1 ▼ |
| Dialing type | Pulse ▼ | Modem init | &F0%S0=12S0=1&K0%COE0&W0&Y0 |
| Caller communication delay | 30 seconds | Called communication delay | 60 seconds |
| Host tel number (main) | 0476343444 | Host tel number (standby) | 0475465767 |

- ◆ **Dialing type:** Choice of the type of dialling to be used for the telephone call to the Supervisor during an alarm sequence. There are two possible choices: pulse (decimal) and multifrequency (MF). **Note:** Configuration available in PSTN but not in GSM.

- ◆ **Modem Init:** The Modem Init sequence is necessary to configure the modem for operation linked to the T200 application. The default Init sequence corresponds to the AT commands necessary for an internal modem (modem installed on the COM card). For an external modem, the Modem Init sequence is not defined in the configuration supplied. It is up to the user to define it according to the brand and model used (refer to the modem manual). **Note:** Configuration available in PSTN but not in GSM.

NB: The Modem Init sequence is sent to the modem only after initialization of the T200 COM card (following a reset or power up of the T200). After changing the Init sequence, you must remember to reinitialize the COM card for it to be taken into account by the modem.

Default Init sequence: &F0%S0=12S0=1&K0%COE0&W0&Y0.

If in doubt, do not change this default Init sequence, because the T200-Supervisor link is likely to no longer operate correctly.

- ◆ **Caller communication delay:** Maximum delay for connection between the T200 and the Supervisor following a call by the T200 before release of the PSTN line by the T200.
- ◆ **Called communication delay:** Maximum delay for connection between the T200 and the Supervisor following a call by the Supervisor before release of the PSTN line by the T200.
- ◆ **Host tel number (main):** Main phone number that the T200 uses to call the Supervisor during an alarm sequence. The T200 will try to call three times on this "normal" number before switching to the "Backup" number.
- ◆ The codes accepted for telephone numbers are:
 - ❑ 0 to 9 (for the call number);
 - ❑ P (for Pulse = decimal dialling setting);
 - ❑ T (for Tone = MF dialling setting);
 - ❑ W (for Wait);
 - ❑ space bar (for space);
 - ❑ + (equivalent to "00" for international dialling).

Example of config.: "P 00W0674948960" or "P +W0674948960"

Note: A space must be inserted between the "T" or "P" and the call number.

- ◆ **Host telephone number (Standby):** Secondary phone number that the T200 uses to call the Supervisor during an alarm sequence. This phone number is used only if the main number does not reply (i.e. after three unsuccessful attempts). The T200 will also try to call three times on this second number before finally stopping calling, unless another alarm occurs, which will have the consequence of reinitiating the alarm calls from the "Normal" number). Same comment as for the "Normal" number concerning the codes to be used for the call number.

- ❑ **GSM medium** (internal or external modem):

| Port 2 : MODBUS | | | | | |
|--------------------------------|--------------|-------------------------------|-----------------------|----------------------|------|
| GSM (internal modem) | | | | | |
| Transmission speed: | 9600 ▼ bauds | | Number of stop bits | 1 ▼ | |
| | | | Delay before response | 0 ms | |
| | | RTS (or CTS) to message delay | 0 ms | Message to RTS delay | 0 ms |
| Caller communication delay | 30 seconds | Called communication delay | 60 seconds | | |
| Host tel number (main) | 0478554678 | Host tel number (standby) | 0478555678 | | |
| PIN Number | 0000 | | | | |
| SMS service center tel number: | 0689004000 | SMS user tel number | 0674948960 | | |

- ◆ **PIN Number:** Configuration of the SIM card PIN code on four figures.

NB: After three validations of the page configuration or three modem initializations with an incorrect PIN code, the SIM card is blocked. The only solution in this case is to call the operator who will be able to unblock it.

The first time that the T200 initializes the GSM modem, the latter asks the modem if it needs the PIN code.

If the modem replies in the negative, the T200 will not manage the PIN code and the latter will not need to be entered by the user.

On the other hand, if the modem replies that it needs the PIN code, the T200 will manage this parameter and the PIN code must therefore be configured.

Once the PIN code has been initialized a first time, the T200 asks the modem to deactivate use of the PIN code.

The latter will therefore no longer be used by either the T200 or the GSM modem.

- ◆ **SMS service centre tel number:** This is the number of the service centre of the GSM operator which centralizes and stores all the SMS messages sent to reroute them to the end user.

Contact the operator to know this number. It is also possible to find out this number from a GSM telephone using the same operator as that used by the SIM card of the T200, because the number can be looked up in the telephone's configuration parameters.

Finally, it is also possible to find out this number in the port trace following connection of the modem to the GSM network. The number is displayed on the line including the "AT+CSCA" command (see enclosed example: number=0689004000).

- ◆ **SMS user tel number:** SMS number that the T200 uses in the event of an alarm sequence to send the text message to the user who is on standby duty.
Same comment as for the "Normal" telephone number concerning the codes to be used for the telephone number.

GSM modem connection status:

To check the connection status of the GSM modem, there are several possibilities:

- ❑ By flashing of the indicator lamp on the front of the GSM modem:
- **The indicator lamp is lit steadily:** the modem is not connected to the GSM network.
 - **The indicator lamp flashes slowly** (every 2.5 seconds): the modem is connected to the network but there is no remote link.
 - **The indicator lamp flashes rapidly** (every second): the modem is connected to the network and a remote link is established.
- ❑ By consulting the AT commands for modem initialization in the port trace corresponding to the GSM modem: To the "AT+CREG" command requested by the T200, the modem should reply "+CREG: 0.1" when the modem is connected to the network or "+CREG: 0.2" if it is not (see example opposite).

Moreover, when the remote link is established between the T200 and the Supervisor, the port trace also displays protocol frame exchanges between the T200 and the Supervisor.

```

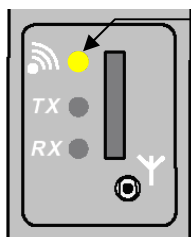
08:48:34.474 MODEM - Power up
08:48:35.986 MODEM - Command mode
08:48:36.994 MODEM - Tx : ATE0
08:48:39.518 MODEM - Tx : AT&S0
08:48:42.045 MODEM - Tx : AT
08:48:43.071 MODEM - Rx : OK
08:48:44.079 MODEM - Tx : AT+CPIN?
08:48:45.120 MODEM - Rx : +CPIN: SIM PIN
08:48:45.120 MODEM - Tx : AT+CPIN=****
08:48:47.230 MODEM - Rx : OK
08:48:47.230 MODEM - Tx : AT+CLCK="SC",0,****
08:48:49.770 MODEM - Tx : AT+CREG?
08:48:50.807 MODEM - Rx : +CREG: 0,1
08:48:50.807 MODEM - Tx : AT+CSCA=0689004000
08:48:54.818 MODEM - Tx : AT+CMCF=1
08:48:57.347 MODEM - Tx : AT+CSAS
08:48:59.875 MODEM - Tx : AT+CME=0
08:49:02.403 MODEM - Tx : AT+C1
08:49:04.929 MODEM - Tx : AT+D2
08:49:07.455 MODEM - Tx : AT+IPR=0
08:49:09.983 MODEM - Tx : ATSO=1
08:49:12.509 MODEM - Tx : AT+WIND=0
08:49:15.039 MODEM - Tx : AT+CICB=0
08:49:17.567 MODEM - Tx : AT+CBST=7,0,1
08:49:20.101 MODEM - Tx : AT&W
08:49:20.101 MODEM - Modem GSM initialized
  
```

Example of port trace during an attempt to connect to the GSM network (Modem Init)

```

11:38:37.093 SlaveAddr = 03 <<<<< Reading N output words
                                         Addr = 0x34
                                         03 03 00 34 00 03 45 E7
11:38:37.113 SlaveAddr = 03 >>>>> Reading N output words
                                         03 03 06 A9 AA AA A9 55 00
                                         F6 9C
11:38:37.357 SlaveAddr = 04 <<<<< Reading N output words
                                         Addr = 0x0
                                         04 03 00 00 00 01 84 5F
11:38:37.593 SlaveAddr = 04 <<<<< Reading N output words
                                         Addr = 0xf
                                         04 03 00 0F 00 21 B5 84
  
```

Example of exchange frames during connection established with the Supervisor (in Modbus protocol)



Yellow status indicator of connection to the GSM network

Indications on the front panel of the GSM modem for the COM card

```

15:59:28.157 MODEM - Tx : AT+WIND=0
15:59:30.683 MODEM - Tx : AT+CICB=0
15:59:33.210 MODEM - Tx : AT+CBST=7,0,1
15:59:35.741 MODEM - Tx : AT&W
15:59:48.333 MODEM - Modem GSM initialised
16:00:18.546 MODEM - Asking for level reception
16:00:19.581 MODEM - Rx : 20
16:00:19.590 MODEM - Rx : OK
16:00:39.732 MODEM - Asking for level reception
16:00:40.766 MODEM - Rx : 20
16:00:40.774 MODEM - Rx : OK
16:01:00.916 MODEM - Asking for level reception
16:01:01.950 MODEM - Rx : 23
16:01:01.957 MODEM - Rx : OK

```

Level of GSM reception :

It is possible to know the level of GSM signal received by the modem of T200.

This function is very useful to know if the T200 can correctly received frames from the Supervisor or to adjust the installation of the antenna on the support to optimize the reception.

To know the level of GSM signal received, you just have to consult the port trace corresponding to GSM modem.
Once the modem is initialized, the T200 display automatically on screen the level of GSM signal reception.

Remark : When the T200 detect a frame form the Supervisor, the display of protocol frames gets priority from the GSM level indication.

Possible values for GSM signal :

- Reception GSM not detectable : level = 99
- Reception GSM not sufficient : level = 0 à 10
- Reception GSM correctly detected : level = 11 à 31

❑ **FSK or FFSK radio medium** (internal or external modem):

| Port 1 : MODBUS | | | | | |
|---|--------------|-------------------------------|-------------|-----------------------|--------|
| 600/1200 Bauds FSK radio (internal modem) | | | | | |
| Transmission speed: | 1200 ▼ bauds | Parity: | No parity ▼ | Number of stop bits | 1 ▼ |
| Frame error on noisy start | Yes ▼ | Frame error on idle interval | Yes ▼ | Delay before response | 0 ms |
| | | RTS (or CTS) to message delay | 150 ms | Message to RTS delay | 100 ms |
| Caller communication delay | 30 seconds | Called communication delay | 60 seconds | | |

- ♦ **Caller communication delay:** Maximum delay for connection between the T200 and the Supervisor following a call by the T200 before release of the radio link by the T200.
- ♦ **Called communication delay:** Maximum delay for connection between the T200 and the Supervisor following a call by the Supervisor before release of the radio link by the T200.

❑ **FSK LL 600/1200 baud medium** (internal modem):

| Port 1 : MODBUS | | | | | |
|--|--------------|-------------------------------|-------------|-----------------------|--------|
| 600/1200 Bauds FSK LL (internal modem) | | | | | |
| Transmission speed: | 1200 ▼ bauds | Parity: | No parity ▼ | Number of stop bits | 1 ▼ |
| Frame error on noisy start | Yes ▼ | Frame error on idle interval | Yes ▼ | Delay before response | 0 ms |
| | | RTS (or CTS) to message delay | 150 ms | Message to RTS delay | 100 ms |
| Line type | 4 wires ▼ | | | | |
| Caller communication delay | 30 seconds | Called communication delay | 60 seconds | | |

- ♦ **Line type:** Configuration of the type of LL line installed between the T200 and the Supervisor.
There are two possible configurations: two-wire or four-wire.

□ **GPRS medium (internal modem):**

■ **GPRS operating conditions on T200:**

For GPRS communication between the T200 and the Supervisor to be able to operate, certain essential conditions must be obtained from the network operator:

- **The T200 must have a fixed IP address assigned by the operator:**

The GPRS connection will not be able to operate if the T200 has a dynamic IP address, because at the Supervisor end it will not be possible to know the new IP addresses assigned to the T200 by the operator following a reassignment. As a result, it will not be possible to initialize protocol communication from the Supervisor.

Likewise, it will not be possible either to log on to the embedded Web server of the T200 remotely from an Ethernet access if the IP address of the T200 is not known.

The only way to know the IP address of the T200 in this case is to log on locally (on site) to the embedded Web server of the T200 via an USB access, which is hardly possible because that would imply going to the site for each enclosure each time an IP address is reassigned.

As soon as the T200 is connected to the GPRS network, the IP address assigned to the T200 is displayed in the "Server IP address" field that can be consulted in the "Maintenance/IP server ports" page (see image below). It is this address that must be used at the Supervisor end to connect to the T200 via Ethernet or via the protocol.

Comment: When connection to the GPRS network is not established, dashes ("-") are displayed in place of the IP addresses.

Communication interface (2)

| | | | |
|---------------------------|-----------------|---------------------------|-----------------|
| Server IP address: | 193.251.238.177 | Remote IP address: | 192.168.111.111 |
|---------------------------|-----------------|---------------------------|-----------------|

- **The IP ports used by the T200 must be opened by the operator:**

A number of ports are used for the T200 application. The list of ports used can be consulted in the "Maintenance - IP server ports" page of the T200 Web server (see image below). All the ports mentioned in this page must be opened at the GPRS operator level for the functions associated with these ports to be able to operate. If this is not the case, it is always possible to select different port numbers in this page to match port numbers available at the operator end.

Example: "HTTP server" port N°80 is not open for the operator "Orange". A port number greater than 1024 should be configured on the T200 to have an open port from this operator.

IP Ports configurations

TCP services

| | | | | | |
|---------------------------------|------|---------------------------------|------|---------------------------------------|------|
| HTTP server port | 80 | Telnet Server port | 23 | | |
| Trace port 1 server port | 1168 | Trace port 2 server port | 1169 | Trace port TCP/IP serveur port | 1170 |

■ Configuration of GPRS parameters:

| Port 2 | | | | | |
|--------------------------|--------------------------|-----------------|------------|---------------------|-------|
| GPRS | | | | | |
| Access Point Name | internet-entreprise | | PIN Number | 0000 | |
| Daily disconnect | <input type="checkbox"/> | Disconnect hour | 0 | PPP session timeout | 5 min |
| Specific Ping IP Address | 0.0.0.0 | | | Test Ping | |
| Ping time interval | 4 min | Ping attempts | 3 | Ping timeout | 5 s |
| Authentication | <input type="checkbox"/> | Login | | Password | |

- ◆ **Access Point Name (APN):** Access Point Name. Name of the access point for connection to the GPRS network. This name is generally given by the operator who provides access to the GPRS network. (e.g. "internet-entreprise" for the operator Orange).
- ◆ **PIN number:** Same as for GSM modem.
- ◆ **Daily disconnect:** One of the special features of GPRS operation is that in some cases of network unavailability, the T200 does not detect this link break. The T200 will therefore remain connected continually to the network (unavailable) even though the physical link is broken. The T200 can therefore remain indefinitely in this mode and will no longer have a means of reconnecting to the network, even if it is available again, because to do so it would have to be forced to disconnect from the network to then be able to reconnect.
As a consequence, without a means of forcing automatic disconnection/reconnection, the T200 will not by itself be able to restore connection to the network.

The "Daily disconnection" option has therefore been provided to play this role and thus allow T200 disconnection from the GPRS network to be forced automatically so as to reconnect it immediately afterward. This disconnection can be programmed for a fixed time each day by means of the "Disconnection time" setting.
This system works, but has the disadvantage that in the worst case scenario the T200 may remain for at most 24 hours without any real connection to the network (case of a brief network failure occurring just after the daily disconnection time).
- ◆ **Disconnect hour:** Configuration of the selected daily disconnection time according to the criteria described previously in "Daily disconnection". This option should be entered only if the "Daily disconnection" option is used.
- ◆ **PPP session timeout:** Configuration of the delay maximum before disconnection of T200 from GPRS network, in case of no data transfer detected by the T200.
- ◆ **Specific ping IP address:** The ping in theory makes it possible to verify and measure the quality of the equipment's connection with another device connected to the IP network.
This configurable parameter can determine to what IP address will be sent the packet corresponding to the ping allowing this quality to be measured.
Configure, for example, a known Web server IP address or possibly that of the supervisor, provided that the latter incorporate a known fixed IP address.
The configured address must correspond to a standard IP address format, i.e. be in the form of four values of at most three digits separated by a dot (e.g. 192.168.2.101).

Operating principle of the regular ping test:

For the T200 application, the regular ping test is used chiefly as a means of extending connection to the GPRS network, when the Supervisor is no longer capable of performing protocol communication with the T200 even though the GPRS network is still operational.

Now, the T200 is designed to monitor the IP data packet flow reaching it via the GPRS network.

A 5 min. time delay ("PPP session timeout") automatically disconnects the T200 from the GPRS network if no IP data flow reaches the T200. Accordingly, if the T200 is disconnected from the network, the modem will be reinitialized, thereby making the T200 unavailable for 1 min., the time needed for reconnection of the modem to the GPRS network.

To avoid this drawback, the regular ping test is used to prevent disconnection of the T200 when the problem is exclusively due to the Supervisor and not to a network problem. In other words, if the T200 is still connected to the GPRS network, there is no reason to disconnect it because of a non-existent IP protocol flow.

As soon as a ping address has been configured in this field, the T200 will try every 4 minutes ("*Ping time interval*") to send a ping to the specified IP address. Accordingly, an IP data flow will return to the T200 and the latter will not cut off the connection to the network.

If the result of the ping test is satisfactory, the T200 will remain connected to the network, because it knows that it is available. The T200 will then do nothing in particular except for the next ping test following the next 4 minutes elapsed.

If the result of the ping test is unsatisfactory, after an extra minute the T200, seeing no IP data flow for the last 5 min., will disconnect from the network automatically (modem reset), and then try (after the end of modem initialization) to reconnect to the network again.

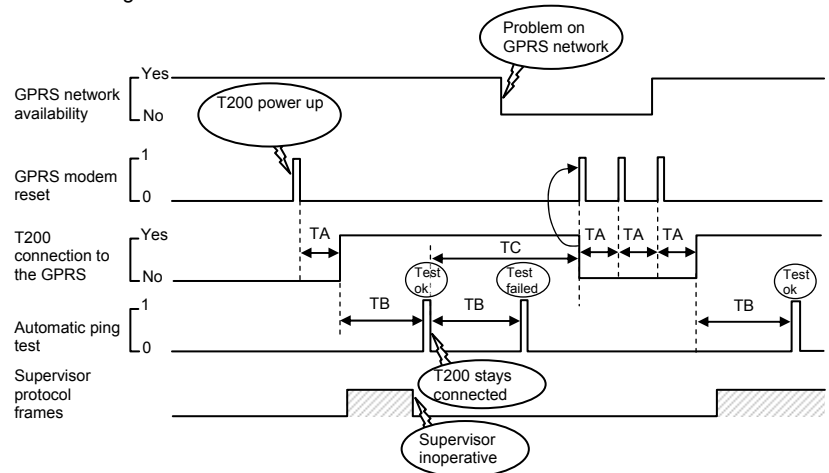
If the network is still not available, the T200 will again request the modem to reinitialize immediately, and this indefinitely until the next detection of the network.

This phase of initialization and reconnection to the network requires approximately 1 min. for the GPRS modem (see enclosed diagram).

If the ping address is set to "0.0.0.0" (default value), the regular ping test is deactivated.

Comment: The regular ping test method is preferable to the "Daily disconnection" method because, for the regular ping test, network disconnection lasts only 5 min. at most during a brief failure (case of network disconnection just after the ping test).

Note: The regular (or manual) ping test sends to the specified IP address the smallest possible number of data packets (equivalent to 0 byte), to avoid causing the extra cost of an IP data flow transfer.



TA = Time for modem initialization + connection to the GPRS network (approximately 1 minute)

TB = Ping test period (4 minutes)

TC = Modem reset time (= 5 min.) if IP data flow non-existent on the T200

- ◆ **Test Ping:** Allows manually activation of the ping test. A click on this button starts a manual ping test. This manual test is generally used to verify T200 connection to the GPRS network immediately. The T200 then displays the result of the test in a specific window (see enclosed windows). There are two possible results following this test: "Ping Ok" or "Ping failed"




```

08:48:34.474 MODEM - Power up
08:48:35.986 MODEM - Command mode
08:48:36.994 MODEM - Tx : ATE0
08:48:39.518 MODEM - Tx : AT&S0
08:48:42.045 MODEM - Tx : AT
08:48:43.071 MODEM - Rx : OK
08:48:44.079 MODEM - Tx : AT+CPIN?
08:48:45.120 MODEM - Rx : +CPIN: SIM PIN
08:48:45.120 MODEM - Tx : AT+CPIN=****
08:48:47.230 MODEM - Rx : OK
08:48:47.230 MODEM - Tx : AT+CLK="SC",0,****
08:48:49.770 MODEM - Tx : AT+CREG?
08:48:50.807 MODEM - Rx : +CREG: 0,1
08:48:50.807 MODEM - Tx : AT+CSCA=0689004000
08:48:54.818 MODEM - Tx : AT+CMCF=1
08:48:57.347 MODEM - Tx : AT+CSAS
08:48:59.875 MODEM - Tx : AT+CMEE=0
08:49:02.403 MODEM - Tx : AT&C1
08:49:04.929 MODEM - Tx : AT&D2
08:49:07.455 MODEM - Tx : AT+IPR=0
08:49:09.983 MODEM - Tx : AT&S0=1
08:49:12.509 MODEM - Tx : AT+WIND=0
08:49:15.039 MODEM - Tx : AT+CICB=0
08:49:17.567 MODEM - Tx : AT+CBST=7,0,1
08:49:20.101 MODEM - Tx : AT&W
08:49:32.706 MODEM - Tx : AT+CGCLASS?
08:49:33.720 MODEM - Rx : +CGCLASS: "B"
08:49:33.720 MODEM - Tx : AT+CGDCONT=1,"IP","internet-
company"
08:49:36.248 MODEM - Tx : AT+CGATT=1
08:49:38.769 MODEM - Tx : AT+CGREG?
08:49:39.784 MODEM - Rx : +CGREG: 0,1
08:49:39.784 MODEM - Tx : AT+CGACT=1,1
08:49:42.307 MODEM - Tx : ATD*99***1#
08:49:43.327 MODEM - Connection
08:49:44.335 MODEM - PPP link: UP -> ESTABLISH ()
08:49:44.350 MODEM - PPP link: OPEN -> AUTH ()
08:49:44.363 MODEM - PPP link: PAP: Local successfully
authenticated
08:49:44.363 MODEM - PPP link: SUCCESS -> NETWORK ()
08:49:44.363 MODEM - PPP link: IPCP UP -> NETWORK ()
08:49:44.400 MODEM - PPP link: IPCP CONFIGURED ->
NETWORK ()
08:49:44.401 MODEM - PPP link: connected,
local=90.95.65.78, dest=212.234.96.90
08:49:44.401 MODEM - GPRS modem initialized

```

Example of port trace in the event of a connection to the GPRS network

- ◆ **Ping time interval:** Delay between two successive automatic "Test ping".
- ◆ **Ping attempts:** Number of maximum attempts for the "Test ping" process in case of no response from remote IP address.
- ◆ **Ping time out:** Maximum delay to wait for the response during the "Test ping" to define "Ping error".
- ◆ **Authentication:** When the GPRS network requires authentication during the connection phase, it is possible in such cases to activate this function by checking the corresponding box.
The authorized encryption protocols are:
- PAP, CHAP, MSCHAP, MSCHAP V2
- ◆ **Login:** Configuration of the login used for authentication. Configure this field only if the "Authentication" option has been checked.
- ◆ **Password:** Configuration of the password used for authentication. Configure this field only if the "Authentication" option has been checked.

Note: To check that the modem is correctly connected to the GPRS network, it is possible to consult the trace of the port corresponding to the GPRS modem. The modem starts by initializing the GSM connection and then the GPRS connection. Accordingly, following the AT commands for connection to the GSM network can be found the commands relating to GPRS connection. At the end of them, the trace should indicate "GPRS modem initialized" with also the indication of the IP addresses of the T200 assigned by the operator (local=xxx.xxx.xxx.xxx) and the IP address of the GPRS gateway provider (dest=xxx.xxx.xxx.xxx) (see example opposite).

Modem connection status:

Same comment as for the GSM modem.

| Settings |
|---------------------------------|
| Communication |
| Operation mode |
| Protocol (+TCP/IP (1)) |
| Port 1: transmission |
| Port 2: transmission |
| Modbus master |
| Communication |
| Slaves Configuration |
| Control Module n°1 |
| Control & Automation |
| Measurement/Fault Indicator |
| Variable management |
| Variable configuration |
| Classes configuration |

4.3 Switch control parameters

Objectif : Set processing of the switch control for each channel.
Access: "**Settings/Control & Automation**" page.

Remote configuration: The @ sign alongside each parameter of the "Control and automation" page allows an external address to be configured so as to be able to change the parameter's configuration from the Supervisor via the protocol used (if the latter so permits).

► **Type of control:**

There are four possible options: **Standard, PM6, CI2, Other**

| Control and Automation n°1 | |
|---------------------------------------|------------|
| Control order | Channel 1 |
| Control type | Other @ |
| Return position waiting time | Standard @ |
| No complementary filtered time | PM6 @ |
| Operating time (except PM6) | CI2 @ |
| | Other @ |
| | 2200 ms @ |

Comment: The "CI2" and "Other" options are not managed at present.
The "PM6" option is managed but applies only to the T200 P.

The management of switch position control and monitoring signals is specific to each type of switch.

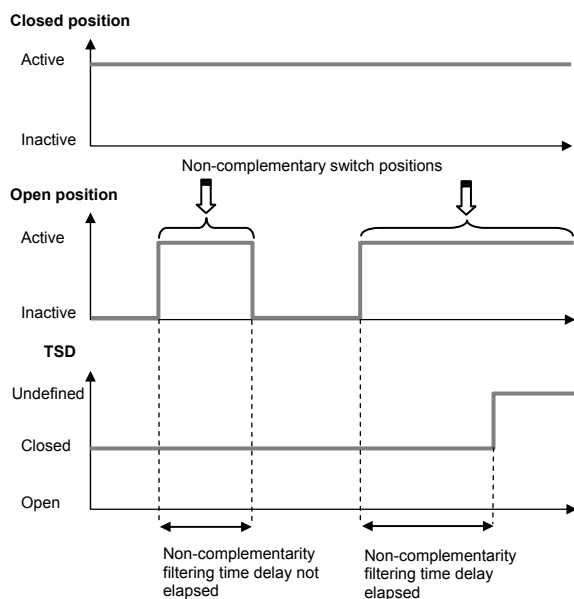
The "Standard" option applies to the main cubicles used with a T200 I, in particular Merlin Gerin cubicles of type SM6 or RM6.

□ Filtering principle for indication inputs related to remote controls:

The interface between the T200 and the switch includes two electric signals for motorization control (CO: Opening control / CF: closing control) and two signals for the current switch position (O: open position / F: closed position).

The T200 systematically performs a consistency check on the positions read: it is in theory impossible to have the "open" and "closed" signals simultaneously or neither of the two signals at the same time, but this may occur following a system malfunction. This complementary of the switch states is verified cyclically for updating the states of the associated TSD variables.

In the case of non-complementary values, filtering is applied and the old TSD value is kept during a configurable time delay (see **No complementary filtered time** parameter). If the non-complementary persists after the time delay, this is probably due to a fault relating to the signals delivered by the switch and the "undefined" state is finally indicated in the TSD associated with the position.



□ Principle for switch position order processing:

The T200 internal control manager inhibits any order until the previous order has been completed. The order processing status can be known by consulting the events from the supervisor or in the local event log. The events generated according to the order processing status are summarized in the following table:

| Phase | Event |
|----------------------------------|---|
| Receipt of a switch order | <ul style="list-style-type: none"> ■ TCD xx - Switch state - Order ■ CR order in progress |
| End of order processing | CR end of order |
| End of degraded order processing | CR external error or CR severe fault CR end of order |

4.3.1 "Standard" type control

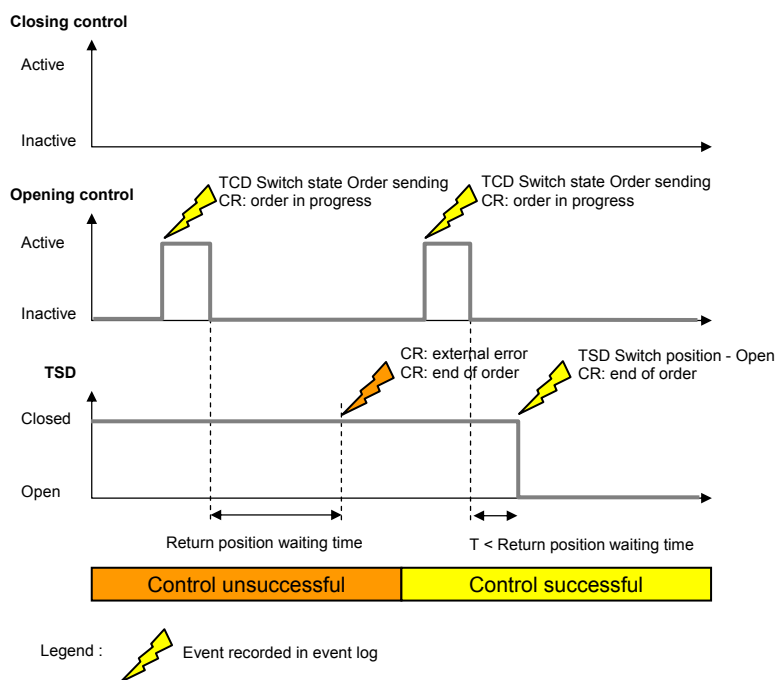
Reminder: The "Standard" configuration applies to the main switches used with the T200 such as SM6 or RM6.

| Control order | Channel 1 |
|--------------------------------|------------|
| Control type | Standard @ |
| Return position waiting time | 15000 ms @ |
| No complementary filtered time | 10000 ms @ |
| Operating time (except PM6) | 2200 ms @ |

The principle of an order on the switch is to activate the switch control signal (24V or 48V polarity depending on the model) for a determined time (**Operating time** parameter).

With "Standard" control, the duration of the order is therefore fixed by this time delay and does not depend on the time taken by the switch to change position. The Open and Closed switch position inputs are read constantly throughout the duration of the order with a consistency check so as to update the associated position TSD variable (see Filtering principle for indication inputs related to remote controls).

After the control relay has fallen, the order is considered as completed by the T200 when the switch indicates a position in conformity with the order (the TSD is updated with the new status). The order is considered in error (e.g. external error) if the position is not in conformity with the requested order or if undefined after a loss of position filtering time delay (**Return position waiting time**).



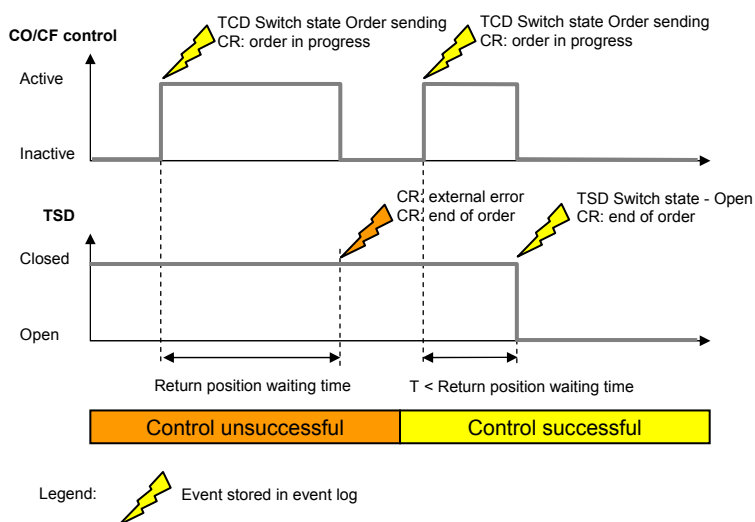
4.3.2 "PM6" type control

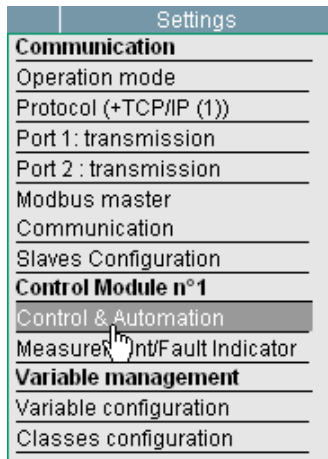
This switch option is in theory not applicable for the T200 I. Applies only to the T200 P associated with a PM6 switch.

With this type of switch, the principle is to apply the motor control signal until the requested position is obtained. This control will be maintained only during a configurable limited period (**Return position waiting time** parameter), and this in the event that the position indicated by the TSD variable is not that which is expected by the T200 (case of degraded control).

With this type of switch, the time for execution of the electrical order therefore depends exclusively on the time taken by the switch to change position. The Open and Closed switch statuses are read constantly with a consistency check so as to update the associated position TSD variable (see *Filtering principle for indication inputs related to remote controls*).

| Control order | Channel 1 |
|--------------------------------|-----------|
| Control type | PM6 |
| Return position waiting time | 15000 ms |
| No complementary filtered time | 10000 ms |
| Operating time (except PM6) | 2200 ms |





4.4 Parameters of the various options

Access: "Settings/Control & automation" page.

Some specific options allow operation of the T200 to be customized for the needs of certain users.

One must be a system administrator to be able to modify these options.

The T200 is generally delivered without these specific options being activated (factory settings).



The list of these configurable options is described in detail below:

❑ Automatism On/Off per way :

In standard configuration, automatic control is enabled or disabled generally on all the channels of a given CONTROL module. By selecting this option, it is possible to enable or disable automatic control channel by channel on this module.

Note: When this option is selected, it is necessary to also add variables in the T200 configuration to manage this function. To do so, use the "OFF Line Configurator" on the Easergy CD supplied with the T200, a tool with which you can generate a T200 configuration file compatible with this option.

❑ 8 bits measurements :

By default, on the T200 I series 3, the current (or voltage) measurements are coded on 16 bits, whereas on the preceding series they were coded on 8 bits. By selecting this option, however, it is possible to make the T200 compatible with the old-generation T200s. This option is used especially when a Supervisor already polls T200s of an old generation with measurements on 8 bits. Now, a given Supervisor can hardly read measurements in 2 different formats.

Note: Same comment as for the previous option concerning the possibility of using the "OFF Line Configurator" to generate a configuration file compatible with this option.

❑ Circuit breaker signalisation management :

There are several ways of acquiring status information coming from the switch (pins 7, 8 and 9 of the 10-pin Harting connector for cubicle connection). The option chosen affects the way in which the T200 processes this information.

There are several possible choices for this option:

- ❑ **Standard:** This is the factory settings. The connections for the switch link corresponding to this mode are shown opposite.
In this mode, the presence of the "Switch locked" signal inhibits the execution of orders on the switch.
The "MV voltage present" signal is used by the ACO automatic control.
- ❑ **Earthing switch management by TSD:** As standard, a single signal coming from the switch is used to give the T200 the status of the earthing switch (pin 7 of the 10-pin Harting connector).
By selecting this option, an additional input (pin 8) is used to manage the earthing switch as a TSD and not a TSS.

| Connector pin | Marking | Function |
|---------------|---------|--------------------|
| 1 | - | 0V |
| 2 | CC | Closing control |
| 3 | OC | Opening control |
| 4 | O | Open position |
| 5 | F | Closed position |
| 6 | + | + V |
| 7 | ST | Switch locked |
| 8 | HTA | MV voltage present |
| 9 | | Not Connected |
| 10 | | Not Connected |

Switch TSS management – "Standard" mode

| Connector pin | Marking | Function |
|---------------|---------|-------------------------|
| 1 | - | 0V |
| 2 | CC | Closing control |
| 3 | OC | Opening control |
| 4 | O | Open position |
| 5 | F | Closed position |
| 6 | + | + V |
| 7 | ST F | Earthed Closed position |
| 8 | ST O | Earthed Open position |
| 9 | | Not Connected |
| 10 | | Not Connected |

Switch TSS management – "Earthing switch by TSD" or "Specific 1" mode

| Connector pin | Marking | Function |
|---------------|---------|-----------------|
| 1 | - | 0V |
| 2 | CC | Closing control |
| 3 | OC | Opening control |
| 4 | O | Open position |
| 5 | F | Closed position |
| 6 | + | + V |
| 7 | B1 | Free 1 |
| 8 | B2 | Free 2 |
| 9 | | Not Connected |
| 10 | | Not Connected |

Switch TSS management – "Free TSS" mode

The "Earthed Open Position" absent and "Earthed Closed Position" present states inhibit the execution of orders on the switch. The ACO automatic control cannot be used in this mode.

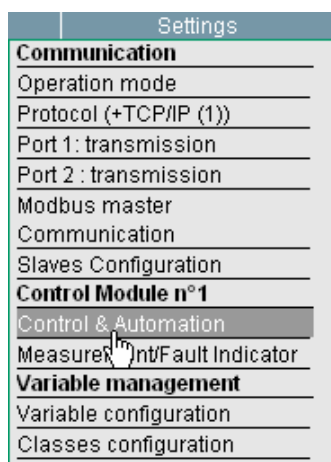
- ❑ **Free TSS:** In this mode, pins 7 and 8 normally assigned to "Switch locked" and "MV voltage present" can be used freely. They therefore have no function predefined by the T200. They are merely DIs. There is no inhibition of execution of orders on the switch whatever the status of the free inputs. The ACO automatic control cannot be used in this mode.
- ❑ **Specific mode 1:** This mode is similar to the "Earthing switch management by TSD" mode, with an additional special feature: When the T200 is in local mode, all orders to the switch are inhibited. The automatic controls can therefore no longer operate in Local mode. The connection system is identical to the "Earthing switch management by TSD" mode.

Note: Same comment as for the previous option concerning the possibility of using the "OFF Line Configurator" to generate a configuration file compatible with this option.

❑ Command state control before execution:

This option permits to define if the T200 will check the position of the switchgear before to send the command. For instance, if configure as "No", it will be possible to send a close command to a switchgear already in close position (same process for open command).

Note : a command will be no send if there is no return of position of switchgear or if position is close and open at the same time.



| Automation | |
|------------------------------|---------------|
| Channel 1 | |
| Automation type | Sectionalizer |
| Default counter clear time | 20000 ms |
| Number of authorized default | 1 |

Example of configuration for sectionalizer automatic control (Configuration/Control & Automation page)

4.5 Automatic control parameters

Access: "Settings/Control & Automation" page.

4.5.1 Sectionalizer automation control

The purpose of this automatic control is to order opening of the MV switch managed by the T200 following the detection of a number of fault currents during unsuccessful slow resetting cycles for the upstream circuit breaker. The sectionalizer automatic control therefore converts the switch into a sectionalizing switch.

For the automatic control to work, the T200 must be provided with the fault current detection function.

For automatic control to operate on a channel, it must be selected for that channel (**Automatic type** parameter).

It is possible to assign the presence of automatic control or not channel by channel. All the channels of the T200 can be configured with this automatic control or not.

Automatic control can be enabled or disabled, in general on the T200 (TCD 9), remotely from the Supervisor or locally via the CONTROL panel of the T200.

NB: It is not possible to change the type of automatic control on a channel when the "automatic control Enabled/Disabled" TSD (TSD 9) is in ON position. It is essential to return TSD9 to OFF position to be able to change type of automatic control on one of the channels.

Likewise, it is not possible to send a remote control to the TSD 9 to place it in ON position, if no automatic control is activated on one of the channels of the corresponding CONTROL module.

Manual control of the switches remains possible in "Local" mode from the CONTROL panel or in "remote" mode from the Supervisor, even if automatic control is activated in ON position.

Operation:

In nominal operating conditions, the line is energized and the switch is closed.

The automatic control system sends an opening order to the switch if:

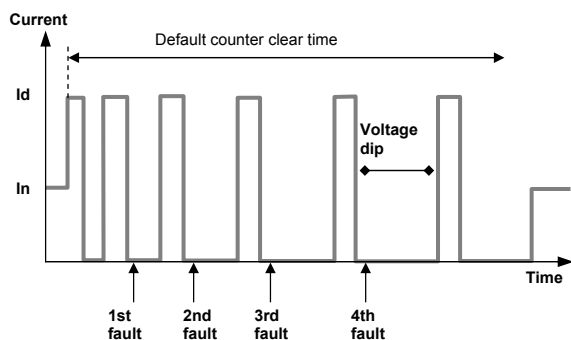
- the switch is closed;
- the counted number of fault currents is reached;
- the current fault has disappeared;
- the MV voltage is not present.

Important note: The "Rapid" fault can be counted as the first fault detected by the T200 if the time to detect the "slow" fault configured on the T200 is less than the actual time of presence of the first "rapid" fault or if the actual time of presence of the rapid fault is the same as that for the slow fault (that depends on the network configuration).

The enclosure must be powered from a low-voltage source generated by the MV line on which the unit is installed.

Configuration parameters:

| Parameter | Description | Config. range |
|-------------------------------------|--|---|
| Automatic type | Choice of automatic control type. -> Choose Sectionalizer | None or Sectionalizer or Changeover switch or BTA |
| Default counter clear time | Time after which the automatic control system is reset if the conditions of automatic control action are not met. This time begins after first fault detection in the fault elimination cycle. Must be greater than the total time of the source substation resetting cycle. | 20000 to 240000 ms (in increments of 5000 ms) |
| Number of authorized default | Number of faults detected by the T200 before actuating channel opening by automatic control. | 1 to 4 |



4.5.2 ACO automatic control (source changeover)

Automatic changeover control manages automatic changeover of voltage sources of the MV secondary distribution network upstream of the T200 to ensure maximum availability of voltage downstream, in case of failure of one of the voltage sources. Accordingly, upon disappearance of the voltage on one channel, changeover to the other channel is performed automatically, depending on the options configured.

To activate "ACO" automatic control on a channel, simply set the **Automation type** variable as "Changeover switch" from the list of automatic control systems available.

Note: This automatic control is available only on **channels 1 and 2** of each CONTROL module.

It is possible to define by configuration one channel as having priority relative to the other, with or without return to the priority channel if need be.

The priority voltage source can be assigned to channel 1 or 2 by configuration.

Note: For ACO automatic control to be able to operate, it is essential to install VD3H voltage relays and fault current detection on channels 1 and 2.

Several operating modes can be selected (**Type** parameter), namely:

■ **Semi-Auto mode SW1 ↔ SW2 :**

In the event of a voltage loss on the active channel, automatic control switches to the other channel after a time delay T1.

In this mode, there is no concept of priority or backup source. Changeover to one or other of the channels takes place as soon as the changeover conditions are met.

■ **Auto-SW1 mode (or Auto-SW2):**

In this mode, one can define a concept of priority of one channel relative to the other (channel 1 or 2). Automatic control remains on the priority channel so long as the MV voltage associated with that channel is correct.

In the event of a voltage loss on the priority channel, automatic control switches to the other channel after a time delay T1. After the changeover, return to the priority channel occurs if the MV voltage on that channel is presented during a time delay T2.

■ **SW1 → SW2 mode (SW2 → SW1):**

This option allows only one changeover to be enabled.

Automatic control switches only from the priority channel 1 (or 2) to the backup channel. Automatic control then remains on that channel.

Configuration parameters:

| Parameter | Description | Config. range |
|---|---|---|
| Automation type | Choice of automatic control type. -> Choose changeover switch | None or Sectionalizer or Changeover switch or BTA |
| Permutation waiting time (T1) | Waiting time for stability of voltage disappearance on the channel that was operational before the start of the changeover cycle. | 100 ms to 200 s (in increments of 100 ms) |
| Time before returning on normal way (T2) | Waiting time for stability of voltage return on the normal channel before return to that channel | 5 s to 60 s (in increments of 1 s) |
| Type | Choice of changeover type. (see details of operation above) | SW1 -> SW2 or SW2 -> SW1 or SW1 <-> SW2 or Auto - SW1 or Auto - SW2 |

Changeover sequence:

Changeover takes place if the following conditions are met:

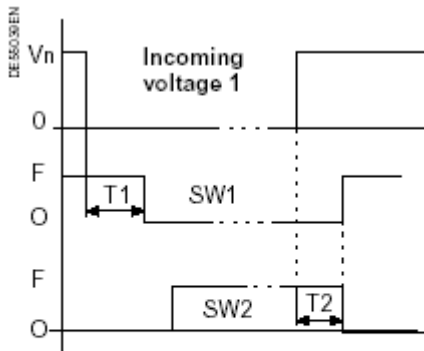
- Automatic control enabled.
- Position of channel 1 and 2 switches complementary: TSD variable SW1 closed position and SW2 open position (or SW2 closed and SW1 open).
- No fault current on the two channels.
- MV voltage absent on the enabled channel.
- MV voltage present on the other channel.

The changeover operation opens SW1 and when SW1 is open, SW2 closes.

The command to close the backup channel is given after the enabled channel is reported open.

Return to the main channel for the "AUTO" modes occurs if:

- the priority channel is open;
- the MV voltage on the priority channel is correct during time delay T2.



Configurable parameters:

■ Operating mode:

SW1 ↔ SW2, Auto SW1 or SW1 → SW2

■ delay time T1 switchover: 100 ms to 200 s

■ time before return T2: 5 s to 60 s

| Automation | |
|-------------------------------------|------------------|
| Channel 1 | |
| Automation type | Autochangeover @ |
| Permutation waiting time | 1000 ms @ |
| Time before returning on normal way | 5 s @ |
| Type | SW1 -> SW2 @ |
| Channel 3 | |
| Automation type | None @ |

Example of configuration for ACO automatic control (**Configuration/Control & Automation** page)

Special feature of reset upon MV voltage return:

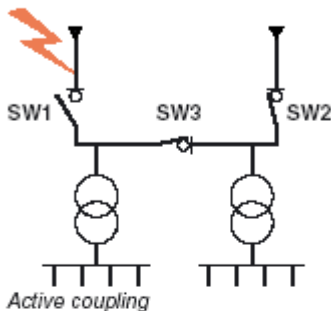
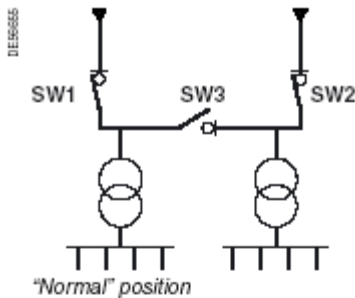
When a current fault is stored in memory on one of the two channels managed by ACO automatic control, MV presence is necessary on both channels at the same time to reset the memory of this fault.

This rule is valid even if only one of the two channels has been configured with active reset upon MV voltage return.

Source transfer locking:

A digital input prevents the transmission of orders from the control panel, the automatic control system and the remote control station (see "ACO automatic control" chapter in the "Installation" section).

This input is generally connected to the downstream circuit breaker.



4.5.3 BTA automatic control (Busbar coupling)

The BTA (Bus Tie Automatism) is an automatic control system for source changeover between 2 incoming cables (SW1 and SW2) and a busbar coupling switch (SW3).

It should be combined with VD3H type power-on detectors and the fault current detection function on the busbar incoming cables.

Operating mode

Two operating modes can be configured:

■ Standard mode:

When the voltage disappears on a downstream busbar, the automatic control system opens its incoming cable (SW1 or SW2) and closes coupling switch SW3. Coupling depends on the absence of fault current on the main source.

■ MV missing backup mode:

After execution of automatic control in standard mode, the presence of voltage is monitored during a configurable period. If the voltage disappears during this period, coupling switch SW3 is opened and the automatic control system is locked.

Coupling sequence

■ Coupling takes place if the following conditions are met:

- Automation is enabled.
- Incoming channel switches SW1 and SW2 are closed.
- Earthing switches SW1, SW2 and SW3 are open.
- Voltage is absent on one of the incoming cables SW1 or SW2.
- Voltage is present on the other incoming cable.
- There is no fault current detection on SW1 and SW2.
- Transfer locking is absent.

■ The coupling sequence in standard mode is:

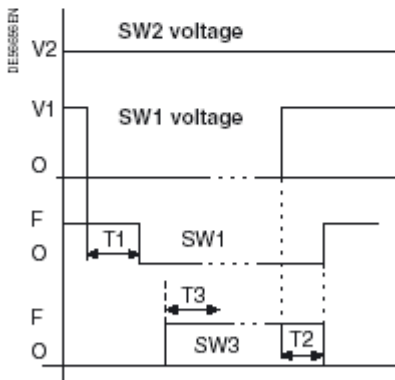
- Opening of the incoming cable switch which is powered off following a time delay T1.
- Closing of coupling switch SW3.

■ The coupling sequence in the mode with "MV missing backup" is supplemented as follows:

- Monitoring of voltage stability during a time delay T3.
- Opening of coupling switch SW3 if this condition is not met.
- Locking of BTA automatic control.

■ Return to normal mode after coupling occurs if:

- The option of "return on SW1 or SW2" is activated;
- The voltage on the channel has become normal once again during a time delay T2;
- Automatic control is enabled;
- Automatic control is not locked;
- Transfer locking is absent.



Configurable parameters:

- Operating mode
- Automatic return SW1/SW2
- Automation system on/off
- Delay before switching
- T1: 100 ms to 60 s in 100 ms steps
- Delay before return
- T2: 5 s to 300 s in 1 s steps
- Interlock delay on voltage loss
- T3: 100 ms to 3 s in 100 ms steps
- Motorisation type: command time.

Coupling locking

A digital input prevents the transmission of orders from the control panel, the automatic control system and the remote control station.

This input is generally connected to the downstream circuit breaker.

Automatic control locking

BTA automatic control is locked if one of the following conditions is met during coupling:

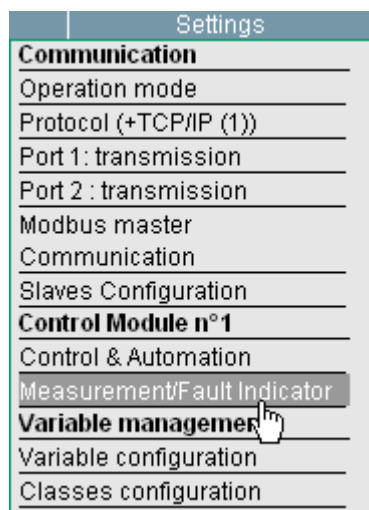
- Failure when ordering switch opening or closing.
- Indication of earthing switch closing.
- Occurrence of a fault current.
- Switch power supply fault.
- Occurrence of coupling locking.
- Manual or remote ON/OFF control of automation.

Configuration parameters:

| Automation | |
|---------------------------|--|
| Channel 1 | |
| Automation type | BTA <input type="button" value="v"/> @ |
| Time before permutation | 5000 ms @ |
| Time before return | 10000 ms @ |
| MV missing backup time | 1000 ms @ |
| Mode of operation | MV missing backup <input type="button" value="v"/> @ |
| Return to SW1 & SW2 close | Yes <input type="button" value="v"/> @ |
| Channel 3 | |
| Automation type | BTA <input type="button" value="v"/> @ |

Example of configuration for BTA automatic control (**Configuration/Control & Automation** page)

| Parameter | Description | Config. range |
|--------------------------------------|--|---|
| Automation type | Choice of automatic control type. -> Choose BTA | None or Sectionalizer or Changeover switch or BTA |
| Time before permutation (T1) | Waiting time for stability of voltage loss before opening the channel | 100 ms to 60 s (in increments of 100 ms) By default: 5000 ms |
| Time before return (T2) | Only if "automatic return SW1/SW2" option set to "yes". Waiting time for stability of voltage return on the normal channel before return to that channel. | 5 s to 300 s (in increments of 1 s) By default: 10000 ms |
| MV missing backup time (T3) | Only for the "Locking upon voltage loss" mode. Waiting time for stability of voltage present on the backup channel. Otherwise, locking of automatic control. | 100 ms to 3 s (in increments of 100 ms) By default: 1000 ms |
| Operating mode | Choice of type of operation (see description above) | Standard or Locking upon voltage loss |
| Return to SW1 & SW2 close | Defines whether the automatic control system should allow return to the normal channel or not | Yes or no |



4.6 Parameters of the fault detection module

Access: "Settings/Measurement-Fault Indicator" page.

The measurement/fault detection function requires the installation, for each channel, of measurement acquisition modules on the interface card and toroids in the cubicle.

The **Measurements/Fault detector** page allows the various fault detection thresholds to be set according to the type of acquisition module installed on T200:

- Current measurement acquisition card (models **AC**, **AS** and **AH**) and its opening toroids
- Voltage measurement acquisition card (models **AT** and **AT-BT**)
- Digital acquisition card for external detectors (model **AD**).

The T200 detects the type of module installed and automatically proposes the configuration associated with that type of module.

4.6.1 Current fault detection:

General rule for configuration: The thresholds I_{max} and I_0 should be set on the T200 to correspond to those set on the circuit breaker protection device upstream of the network.

In theory, the fault detection thresholds and time delays to be set on the T200 should be slightly less than those of the upstream circuit breaker protection device so that the T200 may detect presence of the fault current before opening the CB. Moreover, the current defined for the earth fault detection must be greater than the capacitive current downstream.

Why a reset time on voltage return ?

Once T200 detect the fault, the T200 stores the fault in memory when the mains voltage has disappeared, so as to be able to locate the fault on the network during general interrogation of the T200 from the Supervisor. By default configuration, this memorization is erased when voltage return ON (configurable).

Configuration parameters:

The parameters displayed for each channel depend on the type of acquisition module detected on the interface and on the module configuration. These are summarized in the table below:

| Module | Parameter | Description | Config. Range | Setting on module |
|-------------------|---|--|--|--|
| T200-AC / AS | I_{max} threshold | Fault current detection threshold I_{max} | 100 to 750 A (in 50 A increments) | None |
| | I_0 threshold | Homopolar fault current detection threshold | 20 to 160 A (in 5 A increments) | None |
| T200-AS / AH | I_0 threshold | Homopolar fault current detection threshold | 20 to 160 A (in 5 A increments) 2 to 25 A (in 1 A increments) | Jumpers W1 and W2: Pos. 20 - 160 A Jumpers W1 and W2: Pos. 2 - 25 A |
| | Fault duration | "Slow" fault filtering time. Any fault > I_{max} and of a duration exceeding this time will be considered by the T200 as a "slow" fault. | 50 to 500 ms (in 25 A increments) | None |
| T200-AC / AS / AH | I_{max} fault duration (fast mode) (All inputs) | "Rapid" fault filtering time. Any fault > I_{max} and of a duration exceeding this time and less than the "Time for taking into account I_{max} " will be indicated by the T200 as a "rapid" fault | 50 to 200 ms (in 25 ms increments) | None |
| | Reset on voltage recovery | Reset (if selected) or not of the memory of indication of fault detection upon network voltage return. | Checked or not checked | None |
| | Automatic FPI reset | Maximum time delay for indication of a current fault. At the end of this delay, the fault is erased. | 0 to 120 min. (in 5 min. increments) | None |
| | No parameters setup | None | | |
| T200-AD | No parameters setup | None | | |

| Measurement and FPI configuration n°1 | |
|---|-------------------------------------|
| MV Network characteristics | Channel 1 |
| Nominal Voltage | |
| AC supply OFF | |
| Residual Voltage | |
| I_{max} threshold | 500 A |
| I_0 threshold | 20 A |
| Fault duration | 200 ms |
| I_{max} fault duration (fast mode) (All inputs) | 50 ms |
| Reset on Voltage recovery | <input checked="" type="checkbox"/> |
| Automatic FPI reset | 120 min |
| Power supply functions | |
| Voltage signalisation delay | 7200 s |

Current fault detection threshold configuration page (Settings/Measurement-Fault indicator page)

| Circuit breaker protection side | T200 side |
|---------------------------------|-----------------------------|
| I phase threshold = 350 A | I phase threshold = 330 A |
| I_0 threshold = 45 A | I_0 threshold = 40 A |
| Delay, I_{max} = 250 ms | Delay, I_{max} = 225 ms |
| Delay, I_0 = 250 ms | Delay, I_0 = 225 ms |

Example of fault detector configuration

| Equipment status | | |
|-----------------------------|--|--------|
| Label | | Status |
| Switch state 1 | | |
| Switch state | | Closed |
| Ground disconnecting switch | | Opened |
| MV Presence | | No |
| Earth fault | | No |
| Phase fault | | No |
| Phase current | | 0.0 A |

Example of indications and measurements displayed for a current fault detector (**monitoring page**)

| Measurement and FPI configuration n°1 | | |
|--|-------------------------------------|-----------|
| MV Network characteristics | Channel 1 | Channel 2 |
| Nominal Voltage | | 20000 V |
| AC supply OFF | | 80 % |
| Residual Voltage | | 30 % |
| I _{max} threshold | 500 A | |
| I ₀ threshold | 20 A | |
| Fault duration | 200 ms | |
| I _{max} fault duration (fast mode) (All inputs) | 50 ms | |
| Reset on Voltage recovery | <input checked="" type="checkbox"/> | |
| Automatic FPI reset | 120 min | |
| Power supply functions | | |
| Voltage signalisation delay | 7200 s | |

Voltage fault detection threshold configuration page
(Configuration/Measurements-Fault indicator page)

Note: (*) The rated voltage to be configured corresponds in theory to a line-to-neutral voltage of 63.5 V ($110 \text{ V}/\sqrt{3}$) on entering the voltage acquisition card. If this is not the case (e.g. $100 \text{ V}/\sqrt{3}$), the rated voltage to be configured will have to be multiplied by the following ratio: $110 / \text{line-to-line input voltage}$ (e.g. for an input voltage of $100 \text{ V}/\sqrt{3}$ and a rated voltage of 20000 V, configure $20000 * 110/100 = 22000 \text{ V}$).

| Switch state 1 | | |
|-----------------------------|--|--------|
| Switch state | | Closed |
| Ground disconnecting switch | | Opened |
| MV Presence | | No |
| Residual voltage | | No |
| Voltage absence | | No |
| Voltage | | 0 V |

Example of indications and measurements displayed for voltage fault detection (monitoring page)

Voltage fault detection:

The following parameters should be configured on the T200 for the mains voltage monitoring function to operate:

| Module | Parameter | Description | Config. range |
|------------------|------------------|---|---------------|
| T200-AT or AT-BT | Nominal voltage | Real rated voltage (line-to-line) of the network to be configured (*) | 50 to 30000 V |
| | AC supply OFF | Network rated voltage threshold (as a percentage) below which the T200 detects network power off | 20% to 95% |
| | Residual voltage | Voltage variation of a phase (as a percentage) relative to the other phases for residual voltage fault indication | 5% to 50% |

When the above threshold percentage conditions are exceeded, the T200 generates indications in the form of TSS for which the correspondence with the internal variables of the T200 for each channel is given in the table below:

Correspondence of internal variables of the T200 depending on the type of fault detection:

| Current fault detection variables | | | | | Voltage fault detection variables | | |
|-----------------------------------|-------------|-----------------------------------|--------------------|---------------|-----------------------------------|------------------|---------|
| T200 channel | Phase fault | Earth fault or homop. fault A (*) | Homop. fault (*) B | Phase current | Voltage absence | Residual voltage | Voltage |
| Chnl 1 | TSS 77 | TSS 71 | TSS 72 | TM2 | TSS 77 | TSS 71 | TM2 |
| Chnl 2 | TSS 109 | TSS 103 | TSS 104 | TM9 | TSS 109 | TSS 103 | TM9 |
| Chnl 3 | TSS 141 | TSS 135 | TSS 136 | TM17 | TSS 141 | TSS 135 | TM17 |
| Chnl 4 | TSS 173 | TSS 167 | TSS 168 | TM24 | TSS 173 | TSS 167 | TM24 |
| Chnl 5 | TSS 349 | TSS 343 | TSS 344 | TM84 | TSS 349 | TSS 343 | TM84 |
| Chnl 6 | TSS 381 | TSS 375 | TSS 376 | TM91 | TSS 381 | TSS 375 | TM91 |
| Chnl 7 | TSS 413 | TSS 407 | TSS 408 | TM99 | TSS 413 | TSS 407 | TM99 |
| Chnl 8 | TSS 445 | TSS 439 | TSS 440 | TM106 | TSS 445 | TSS 439 | TM106 |
| Chnl 9 | TSS 621 | TSS 615 | TSS 616 | TM166 | TSS 621 | TSS 615 | TM166 |
| Chnl 10 | TSS 653 | TSS 647 | TSS 648 | TM173 | TSS 653 | TSS 647 | TM173 |
| Chnl 11 | TSS 685 | TSS 679 | TSS 680 | TM181 | TSS 685 | TSS 679 | TM181 |
| Chnl 12 | TSS 717 | TSS 711 | TSS 712 | TM188 | TSS 717 | TSS 711 | TM188 |
| Chnl 13 | TSS 893 | TSS 887 | TSS 888 | TM248 | TSS 893 | TSS 887 | TM248 |
| Chnl 14 | TSS 925 | TSS 919 | TSS 920 | TM255 | TSS 925 | TSS 919 | TM255 |
| Chnl 15 | TSS 957 | TSS 951 | TSS 952 | TM263 | TSS 957 | TSS 951 | TM263 |
| Chnl 16 | TSS 989 | TSS 983 | TSS 984 | TM266 | TSS 989 | TSS 983 | TM266 |

Note: (*) = only for TSS card 3 (T200-AD).

Conversion of current measurements to voltage:

By default, the T200 is designed to operate for current measurements. However, it is possible to configure voltage measurements in place of current measurements on one or more channels of the equipment.

Note that the two types of measurement (current and voltage) are not possible simultaneously on a given channel.

The current to voltage conversion operation requires configuring certain variables of the T200.

The procedure below explains how to carry out this conversion on a channel of the T200. The operation of course impacts the related measurement and fault detection.

Note: With a T200-AT-BT module, voltage measurement is configured in factory on the latest equipment (factory standard).

Note: The maximum voltage that can be displayed in the monitoring page is 32767 V, even if the real network voltage exceeds this value.

Procedure for conversion of current to voltage:

This procedure should be performed on all the channels on which the voltage measurement is present. Of course, the T200-AT-BT voltage module must be installed on the relay interface of the T200 in place of the current module:

- Log on to the T200 Web server as system administrator (user name: "Easergy" and password: "Easergy").

- Go to the "Settings/Variable configuration" page

- In the "Channel x" class corresponding to the channel to be modified, click on the variables described below to change their configuration:

- "Phase fault" variable: rename the "Phase fault" variable name as "Voltage dip fault"
- "Earth fault" variable: rename the "Earth fault" variable name as "Residual voltage fault"
- "Phase current" variable:
 - 1) Rename the "Phase current" variable name as "Mains voltage"
 - 2) If the "Correction factor" was previously set to "Direct/10", change it to "Direct". If it was set to "Direct", change it to "Direct*100." (*)
 - 3) Change the "Unit" field from "A" to "V"
 - 4) Change the "Max. value" field to "32000"

(*) : The "Direct/10" configuration corresponds to the current measurement format for the T200 series 3. The "Direct" configuration corresponds to the current measurement format for the T200 series 2 (or L500 compatible).

4.6.2 Measurement principle on T200 I:

Current (or voltage) measurement on the T200 I is calculated by taking an average of the measurement inputs coming from phases 1 and 2:

Calculated measurement = (I phase 1 + I phase 2) / 2

Phase 3 is therefore not used for measurement.

However, it is used for fault detection.

4.6.3 Configuration of supply voltage monitoring

The T200 activates an "Immediate AC supply OFF" indication (TSS 17) as soon as the enclosure's mains supply voltage is absent.

Another "Delayed AC supply OFF" indication (TSS18) is activated when TSS17 is activated for a time exceeding a configurable period (see opposite).

TSS 18 therefore plays a role of power supply undervoltage signal filtering. The purpose of this filtering is not to send too many successive alarms to the Supervisor whenever TSS17 changes state, following regular MV network failures (e.g. during circuit-breaker reset cycles). It is therefore preferable to use the alarms on the TSS18 rather than on the TSS17 in some cases.

Note: The alarms can be generated only if the remote alarm function is activated on the equipment.

Power supply failure time delay parameter:
configurable from 0 to 21600 seconds

Note: The power supply failure signal is also used by the current fault detector in particular for the automatic control functionality.



Main power supply failure



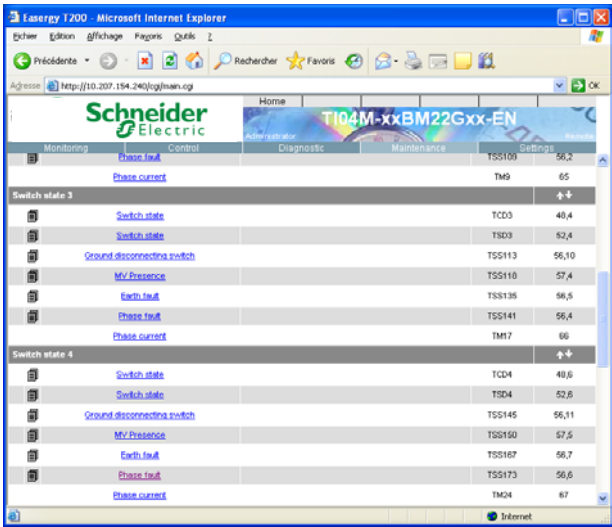
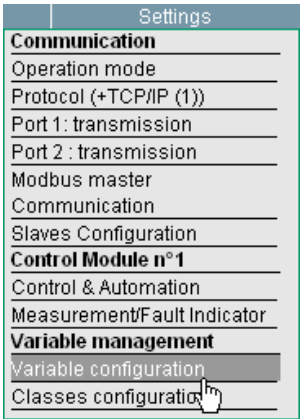
TSS17: Immediate AC supply OFF



TSS18: Delayed AC supply OFF



Time-delayed undervoltage indication



Settings/Variable configuration page

| Type |
|-------|
| TCD1 |
| TSD1 |
| TSS49 |
| TSS54 |
| TSS71 |
| TSS77 |
| TM2 |

Different types of variable existing on T200I



Example of configuration with or without event and alarm saving

4.7 Customization of T200 variables

Access: "Settings/Variable configuration" page.

4.7.1 Definition of variables

T200 is supplied as standard with all the variables necessary for operation of the equipment. This configuration takes into account all the options installed on the equipment (number of channels, type of modem, protocol, other options, etc.). The user can, however, modify this configuration to adapt it to his needs, for example to add options later or to modify the operation of certain functions (e.g. fault detector thresholds, alarms, communication parameters, etc.).

The T200 Web server provides access to all the variables defined by default on the T200.

The level of access to a variable (visible in read-only mode, accessible in write mode, not visible) depends on how the variables have been configured.

The parameters for this page can be consulted and/or modified depending on the user profile.

With the factory settings, you must be an administrator to be able to change the level of access to a variable.

To consult the list of variables configured on the equipment, open the "Settings/Variable configuration" page.

The variables present in this page are grouped by classes.

In each class, a number of variables of several different types are found ("type" column).

Variable types:

The variables break down into several types presented in the table below.

| Variable type | Use | Description |
|---------------|----------------------|---|
| TCD | Double telecommand | Allows control of the switch associated with a channel or enabling/disabling of automatic control. This type of variable is always associated with a TSD. |
| TSD | Double signalisation | Indication of the state of the switch or automatic control (open, closed or undefined). |
| TSS | Single signalisation | Indication of binary state (presence, absence) of certain information managed by the T200 (DI, current faults, etc.). |
| TM | Telemeasurement | Analogue measurements performed by the T200 (current, voltage, etc.). |
| CNT | Counters | Operation or energy counter. |

Note: The T200I contains no variable of the CNT type.

In the standard version it is not possible add extra variables to those already created as standard.

Note: However, when the "local Modbus network" option is present in the equipment, it is possible to add variables corresponding to this option (see "local Modbus network" User Manual for more information).

Variable addresses:

All the variables can be configured with an external address. This external address allows the variable to be made accessible in read or write mode from the Supervisor by means of the protocol used for transmission.

A variable which has no address configured (address = "-") will not be accessible from the Supervisor.

The values of the addresses configured depend on the type of protocol used.

Note: Refer to the user manual for the protocol installed on the T200 for more information concerning the addressing tables related to this protocol.

Saving variables:

T200 included a number of logs allowing archiving of events of various types (event log, alarm log, measurement log).

The logs can be accessed by the user via the embedded Web server ("*Diagnostic*" page).

All the variables can be configured separately with or without being saved as a measurement (if it is a measurement), event or alarm in these logs.

Note: The system log, for its part, does not take into account variable changes of state but rather information concerning the internal operation of the equipment.

When a variable is configured to be saved in a log, a specific symbol appears in the *Variable configuration* page on the same line as the variable:



= Saving to alarm log



= Saving to event log or to measurement log (if it is a measurement).

4.7.2 Events associated with variables

An event is generated by the T200 when a change of state occurs on a variable. The T200 manages two types of event tables associated with these changes of state:

- **The local event table:** This is the event log that can be consulted locally on the T200. The changes of state concerning variables can be recordable in this log or not, the aim being to have a history of changes of variables. For the recording of a change of state on a variable to be effective, the variable must have been defined by configuration as an event ("event" (TM) or "activate recording" (TSS, TSD) box checked in the variable configuration page).
- **The protocol event table:** This is an event stack for protocol communications. This stack will be read by the Supervisor during communications between the T200 and the Supervisor. Contrary to local events, it is not possible to configure a variable with or without saving in the protocol event stack. This is because any change of state on a variable automatically generates saving in this protocol event stack (except for TMs for which one can choose to configure event saving in the stack or not).

Since protocol events are not configurable, we shall speak in the remainder of the chapter only of configuration of the events associated with the local logs. For each type of variable, it is possible to choose how to process the variable for its associated saving (with alarm or not, criterion for saving in an internal log).

The following table summarizes how to save these events for each type of variable. This table is valid for each type of internal log (except the system log).

| Event | TSS | TSD | TM | CNT | Comments |
|----------------------|-----|-----|----|-----|--|
| Change of state | ■ | ■ | □ | □ | Saving upon detecting any change of state of the variable |
| Upon loss of closing | □ | ■ | □ | □ | Saving upon detecting the loss of position of the closed state (although without being open) |
| Regular saving | □ | □ | ■ | ■ | Saving of the variable's state at fixed periods of time |
| High threshold | □ | □ | ■ | ■ | Saving upon exceeding a high threshold |
| Low threshold | □ | □ | ■ | □ | Saving upon exceeding a low threshold |
| Dead band | □ | □ | ■ | ■ | Saving upon % variation of the variable |
| Active maximum | □ | □ | ■ | □ | Saving of the maximum value reached over a given period |
| Active minimum | □ | □ | ■ | □ | Saving of the minimum value reached over a given period |

Note: Configuration available in the *Settings/Variable configuration* page and then by clicking on the name of a variable.

| | | | |
|---------------------|---|---|----------------------------------|
| Periodic treatment | <input type="checkbox"/> Log | <input type="checkbox"/> Event | <input type="checkbox"/> Dial-Up |
| Period | 15 min | Type | Sample |
| Threshold treatment | <input type="checkbox"/> Log | <input type="checkbox"/> Event | <input type="checkbox"/> Dial-Up |
| High threshold | <input type="checkbox"/> Value 0 | | |
| Low threshold | <input type="checkbox"/> Value 0 | | |
| Dead band | <input type="checkbox"/> Log | <input type="checkbox"/> Event | <input type="checkbox"/> Dial-Up |
| Value in % | 10 | | |
| Min and Max log | <input type="checkbox"/> Maximum Active | <input type="checkbox"/> Minimum Active | |
| Period value | 1 Day | | |

Example of events configuration for a TM.
Configuration available in the *Settings/Variable configuration* page and then by clicking on the variable name TMx.

| Event log | |
|-------------------------|---|
| Date/Time | Description |
| 05/05/2022 11:43:10.116 | TSS 23 - Local - Remote position - Local |
| 05/05/2022 11:43:09.229 | TSS 23 - Local - Remote position - Remote |

Example of saving in internal logs

In the local logs, events are registered with a brief descriptive text corresponding to the change of state of the variable and a date and time of occurrence saved by the T200 for locating them in time.

4.7.3 Alarm reporting / Alarm acknowledgement

An alarm should be used for events which must be indicated rapidly to the Supervisor, i.e. without waiting for interrogation by the Supervisor (e.g. if the interrogation frequencies of the SCADA system are rather spaced out over time).

The alarms are therefore valid only for non-permanent type transmission (e.g. PSTN, GSM, Radio), i.e. for types of transmission which require a deliberate interrogation action by the Supervisor.

On a permanent connection (RS232, RS485, OF, GPRS, LL), it is therefore not necessary to use the remote alarm function because the retransmission of information between the T200 and the Supervisor theoretically takes place fairly regularly or even continuously (e.g. polling).

Note that the "Alarm configuration" section is displayed in the configuration page for the variable only if the protocol is configured as Master/Master and if at least one of the communication ports is of the non-permanent type.

| Alarms configuration | | <input checked="" type="checkbox"/> Activate |
|--|--|---|
| On status change | On active <input checked="" type="checkbox"/> | On inactive <input checked="" type="checkbox"/> |
| Alarm level : | scada | |
| Delayed alarm <input type="checkbox"/> | <input type="text" value="0"/> Hours <input type="text" value="0"/> Minutes <input type="text" value="0"/> Seconds | |

Settings available in the *Settings/Variable configuration* page and then by clicking on the name of the variable.

Alarm levels in PSTN or GSM:

On a PSTN or GSM link, three configurable access levels associated with an alarm allow definition of the various ways of processing calls during retransmission of an alarm:

- "sms" level: retransmission of the alarm by SMS to an operator on standby duty.
- "scada" level: retransmission of the alarm by the protocol to the Supervisor.
- "scada + sms" level: retransmission of the alarm by the protocol and by SMS.

| | |
|--|-----------------------------|
| Alarm level : | scada |
| Delayed alarm <input type="checkbox"/> | scada + sms scada sms |

Choice of alarm level

Call sequences triggering an alarm on a non-permanent link:

On a non-permanent link, any change of state of a variable, if the latter has been configured to trigger an alarm, give rise to the sending of frames to the Supervisor to inform it of the change of state that has occurred. At the same time, the T200 saves the change of state information in the alarm log.

In PSTN or GSM, the T200 attempts to join the Supervisor three times on the main telephone number, then if this fails makes three further attempts on the backup telephone number. If the call still does not get through, the calls are stopped unless a new alarm occurs, which reinitiates the call sequence from the normal number. The call sequences take into account the time delays configured in the "Protocol" page (refer to the Protocol manual for more details).

In radio mode, the T200 attempts to send a frame over the radio network to the Supervisor to retransmit the change of state information. If the call does not get through, the T200 attempts to call the Supervisor indefinitely without any restriction regarding the number of attempts. The call sequences take into account the time delays configured in the "Protocol" page. It is recommended not to configure excessively short time delays so as not to mobilize the radio network constantly (refer to the Protocol manual for more details).

In all cases, receipt of the event triggering an alarm by the SCADA system causes acknowledgement of the alarm.
If the alarm information does not reach the Supervisor, no acknowledgement is performed.

The acknowledgement of alarms by the SCADA system can be checked in the "Alarm log" via the checked box opposite the alarm that has been acknowledged.

NB: This box is checked by the T200 only for alarm retransmissions on non-permanent links. This is not managed for permanent links.

Note: The acknowledgement is internal to the T200 and is the subject of no particular order from the Supervisor in the frame destined for the T200.

4.7.4 Configuration of double command (TCD)

By clicking on the name of a TCD type variable in the *Settings / Variable configuration* page, one can obtain access to its settings, namely:

Configuration of a TCD:

| Control order configuration | | | |
|--|----------------|-------------------|--|
| General parameters | | | |
| Variable name: | Switch state | Type: | <input checked="" type="radio"/> Double <input type="radio"/> Single |
| Access | OPERATOR | Order | Normal |
| Class | Switch state 1 | | |
| Logical address | TCD1 | Internal address: | 0,0 |
| Logical address of associated input | TSD1 | External address: | 48,0 |
| <div> <input type="button" value="Save"/> <input type="button" value="Cancel"/> </div> | | | |

■ General parameters:

| Parameter | Description |
|--------------------------------------|--|
| Variable name: | Customization of the variable name. |
| Type: | Type of variable, double or single: "Double" by default for a TCD (unmodifiable). |
| Access: | Defines the level of accessibility of this variable (administrator, operator, monitoring). The level of accessibility is defined with the login and password used for access to the Web server. |
| Order: | The SCADA order can be reversed depending on the hardware configuration of the digital outputs of the T200 (active on low level or on high level). |
| Class: | Allows a variable to be associated with a defined class. It is advisable to group together those variables having an information link in the same class so as to make reading in the pages of the Web server easier. |
| Logical address: | Logical address assigned to this variable by the T200. This is in fact the logical name of the variable (TCD+No.) (unmodifiable). |
| Internal address: | Internal address assigned to this variable by the T200. This is in fact a Modbus address for the internal bus link between the CONTROL module and the COM card (unmodifiable). |
| Logical address of associated input: | A TCD is always associated with a TSD. The T200 automatically assigns the TSD which is associated with this variable (in theory, should not be modified). |
| External address: | Address providing access to this variable in read/write mode from the Supervisor via the protocol. The address is specific to each protocol used (Modbus, IEC, DNP3). The basic T200 includes for each variable the configuration of the external addresses corresponding to the installed protocol. An address set to "-" is made inaccessible from the Supervisor. |

Note: Refer to the manual for the protocol which is installed on the T200 for details concerning the external address tables.

4.7.5 Configuration of single signalisation (TSS)

By clicking on the name of a TSS type variable in the *Settings / Variable configuration* page, one can obtain access to its settings, namely:

Configuration of a TSS:

| Digital input configuration | | | |
|------------------------------------|---|---|--|
| General parameters | | | |
| Variable name: | Phase fault | Type: | <input type="radio"/> Double <input checked="" type="radio"/> Single |
| Logical address: | TSS77 | Class: | Switch state 1 |
| Internal address: | 0,0 | External address: | 56,0 |
| Active/Inactive status definition: | Active (1): Yes | Inactive (0): No | |
| Log configuration | | | |
| On status change | On active <input checked="" type="checkbox"/> | On inactive <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> Activate |
| Alarms configuration | | | |
| On status change | On active <input type="checkbox"/> | On inactive <input type="checkbox"/> | <input type="checkbox"/> Activate |
| Alarm level: | scada | | |
| Delayed alarm | <input type="checkbox"/> | 0 <input type="radio"/> Hours <input type="radio"/> Minutes <input type="radio"/> Seconds | |
| <div>Save Cancel TSS Test</div> | | | |

■ General parameters:

| Parameter | Description |
|-----------------------------|--|
| Variable name: | Customization of the variable name. |
| Type: | Type of variable, double or single: "Single" by default for a TSS (unmodifiable). |
| Logical address: | Logical address assigned to this variable automatically by the T200. This is in fact the logical name of the variable (TSS+No.) (unmodifiable). |
| Class: | Allows a variable to be associated with a defined class. It is advisable to group together those variables having the same information link in the same class so as to make reading in the pages of the Web server easier. |
| Access: | Defines the level of accessibility of this variable (administrator, operator, monitoring). The level of accessibility is defined with the login and password used for access to the Web server. |
| Internal address: | Internal address assigned to this variable by the T200. This is in fact a Modbus address for the internal link between the CONTROL module and the COM card (unmodifiable). |
| External address: | Address providing access to this variable in read/write mode from the Supervisor via the protocol. The address is specific to each protocol used (Modbus, IEC, DNP3). The basic T200 includes for each variable the configuration of the external addresses corresponding to the installed protocol. An address set to "-" is made inaccessible from the Supervisor. |
| Active status definition: | Allows definition of a text and a colour to be displayed in the "Monitoring" and "Control" pages to represent the active state of the variable (binary value 1). |
| Inactive status definition: | Allows definition of a text and a colour to be displayed in the "Monitoring" and "Control" pages to represent the inactive state of the variable (binary value 0). |

Note: Refer to the manual for the protocol which is installed on the T200 for details concerning the external address tables.

■ Record configuration:

By record is meant the saving of changes of state in the event log.

| Parameter | Description |
|----------------------|--|
| "Activate" check box | Check this box to activate saving of the variable in the event log according to the following configured criteria. |
| On active | Check this box to save a change of state in the active state of the variable in the event log. |
| On inactive | Check this box to save a change of state in the inactive state of the variable in the event log. |

■ Alarm configuration:

By alarm is meant the saving of changes of state in the alarm log, but also:

- **In PSTN or GSM mode:** call sequence to the Supervisor then retransmission of the alarm corresponding to the change of state.
- **In radio mode:** sending of a frame to the Supervisor to retransmit the alarm corresponding to the change of state.

Comment: The alarms are not used on permanent links. The following configuration should not be used for a permanent link:

| Parameter | Description |
|---------------------------------|---|
| "Activate" check box: | Check this box to activate saving of the variable in the alarm log according to the following configured criteria. |
| On active: | Check this box to save a change of state in the active state of the variable in the alarm log. |
| On inactive: | Check this box to save a change of state in the inactive state of the variable in the alarm log. |
| Alarm level: | Three configurable levels corresponding to the various possibilities for alarm retransmission to the Supervisor (see section on " <i>Alarm reporting / Alarm acknowledgement</i> ") |
| "Time-delayed alarm" check box: | Check this box if the alarm is to be retransmitted to the Supervisor only after a configurable time delay. |
| Time-delayed alarm: | Choice of the unit (hour, minute, second) and the waiting time before retransmission of the alarm. |

■ TSS test:

The "TSS test" button at the bottom of the TSS configuration page allows the TSS to be made active (fictitiously) for a few seconds (10 seconds). That makes it possible, for example, to perform testing of state retransmission to the Supervisor, although without being obliged actually to generate the change of state for this TSS.

4.7.6 Configuration of double telesignals (TSD)

By clicking on the name of a TSD type variable in the *Settings / Variable configuration* page, one can obtain access to its settings.

Note: The configuration is practically identical to that of a TSS. We have noted in this section merely the differences between a TSD and a TSS:

Difference of configuration between a TSD and a TSS:

■ General parameters:

| Parameter | Description |
|---------------|--|
| Type: | Type of variable, double or single: "Double" by default for a TSD (unmodifiable). |
| Other status: | Allows definition of a text and a colour to be displayed in the "Monitoring" and "Control" pages to represent the undefined state of the variable. |

■ Record configuration:

| Parameter | Description |
|-------------------|---|
| On status change: | Check this box to save any change of state of the variable in the event log. |
| On leaving close: | Check this box to save the loss of the switch closed state (loss of the active state of the variable) in the event log. |

■ Alarm configuration:

| Parameter | Description |
|-------------------|---|
| On status change: | Check this box to save any change of state of the variable in the alarm log. |
| On leaving close: | Check this box to save the loss of the switch closed state (loss of the active state of the variable) in the alarm log. |

Digital input configuration

General parameters

Variable name:
Type: Double Single

Logical address: Class: Access:

Internal address: External address:

Active/Inactive status definition:

Active (1):

Inactive (0):

Other status :

Undefined:

Log configuration

☒ Activate

On status change

On event change ☐
On leaving closed ☒

Alarms configuration

☒ Activate

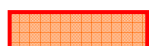
On status change

On event change ☐
On leaving closed ☒

Alarm level :

Delayed alarm ☐

☐ Hours
☐ Minutes
☒ Seconds

 = Difference of configuration between a TSD and a TSS.

4.7.7 Telemeasurement (TM) configuration

By clicking on the name of a TM type variable in the *Settings / Variable configuration* page, one can obtain access to its settings, namely:

Configuration of a TM:

| Measurement configuration | | | |
|----------------------------|---------------|--|---|
| General Parameters | | | |
| Variable name: | Phase current | Correction factor: | Direct/10 |
| Logical Address: | TM6 | Class: | Switch state 1 |
| Internal Address: | 0,0 | External Address: | 64 |
| Unit: | A | Scale: | Max value: 750 Min value: 0 |
| Periodic treatment | | <input checked="" type="checkbox"/> Log | <input checked="" type="checkbox"/> Event <input checked="" type="checkbox"/> Dial-Up |
| | | Period: 15 min | Type: Sample |
| Threshold treatment | | <input checked="" type="checkbox"/> Log | <input type="checkbox"/> Event <input checked="" type="checkbox"/> Dial-Up |
| High threshold | | <input checked="" type="checkbox"/> Value | 500 |
| Low threshold | | <input checked="" type="checkbox"/> Value | 20 |
| Dead band | | <input checked="" type="checkbox"/> Log | <input type="checkbox"/> Event <input type="checkbox"/> Dial-Up |
| Value in % | | 20 | |
| Min and Max log | | <input checked="" type="checkbox"/> Maximum Active | <input checked="" type="checkbox"/> Minimum Active |
| Period value | | 1 Day | |

■ General parameters:

| Parameter | Description |
|--------------------|---|
| Variable name: | Customization of the variable name. |
| Correction factor: | Allows definition of a correction factor for display of the measurement in the <i>Monitoring</i> page. The default factors to be configured for each TM of a T200 series 3 are as follows: - Phase current: "Direct/10" - Mains voltage: "Direct" Note: This factor does not change the format of the measurement sent in the protocol frame. NB: For compatibility of measurements with the T200 series 1 and 2 or with an L500 type supervisor, configure as follows: - Phase current: "Direct" - Mains voltage: "Direct*100" - Also check that the "8-bit measurement" box is checked in the "Miscellaneous" section of the "Settings/Automatic control" page of the CONTROL module concerned by this TM. |
| Logical address: | Logical address assigned to this variable by the T200. This is in fact the logical name of the variable (TM+No.) (unmodifiable). |
| Class: | Allows a variable to be associated with a defined class. It is advisable to group together those variables having an information link in the same class so as to make reading in the pages of the Web server easier. |
| Access: | Defines the level of accessibility of this variable (administrator, operator, monitoring). The level of accessibility is defined with the login and password used for access to the Web server. |
| Internal address: | Internal address assigned to this variable by the T200. This is in fact a Modbus address for the internal link between the CONTROL module and the COM card (unmodifiable). |
| External address: | Address providing access to this variable in read/write mode from the Supervisor via the protocol. The address is specific to each protocol used (Modbus, IEC, DNP3). The basic T200 includes for each variable the configuration of the external addresses corresponding to the installed protocol. An address set to "-" is made inaccessible from the Supervisor. |
| Unit: | Unit to be associated with measurement for display in "Monitoring" page. |
| Max. scale value: | Should correspond to the maximum value that can be taken in practice by the measurement value. For "Raw" or "Normalized" type measurements, this Max. value is used for calculation during measurement retransmission to the SCADA system or for display in the Monitoring page. (see note 2 below). NB: The value configured influences the precision of the measurement. |
| Min. scale value: | Should correspond to the minimum value that can be taken in practice by the measurement value. For "Raw" or "Normalized" type measurements, this Min. value is used for calculation during measurement retransmission to the SCADA system or for display in the Monitoring page. (see note 2 below). NB: The value configured influences the precision of the measurement. |

| | |
|---------------------------------|---|
| Divers | |
| Mise ESHS automatisme par voie | <input type="checkbox"/> ? |
| Mesure 8 bits type T200 série 2 | <input checked="" type="checkbox"/> ? |
| Gestion des TSS interrupteurs | Standard ? |

"8-bit measurement" check box for compatibility of T200 series 2 or L500 type TMs
Excerpted from the page: "Settings/Automat. control"

Note: Refer to the manual for the protocol which is installed on the T200 for details concerning the external address tables.

Note 2: The T200 manages the transmission of measurements to the SCADA system and measurement display in the "Monitoring" page according to two formats:

- ☐ Direct (or adjusted) value: corresponds to the real value in the reference unit (does not take into account the configured "Min. and Max. scale" values).
- ☐ Raw (or normalized) value: corresponds to a value calculated and scaled in accordance with a formula taking into account the configured "Min. and Max. scale" values. (see the protocol User Manual for details concerning measurement calculation).

The choice of "Normalized" or "Adjusted" configuration is generally made in the "Protocol" page.

■ Periodic treatment:

| Parameter | Description |
|----------------------|---|
| "Log" check box: | Check this box to activate saving of the measurement in the measurement log according to the criteria configured below. |
| Period: | Can be used to choose the period for saving of the measurement in the measurement log. |
| Type: | Can be used to choose how to save the measurement: - "Averaged": mean of measurements over the configured period - "Sampled": instantaneous measurement at each configured period |
| "Event" check box: | Check this box to activate saving of the measurement in the protocol event stack according to the period criteria configured below. (see notes 1 and 2 below) |
| Period: | Can be used to choose the period for saving of the measurement in the protocol stack and/or the alarm log |
| "Dial up" check box: | Check this box to activate saving of the measurement in the alarm log and sending of a frame to the Supervisor according to the period criterion configured above. |

Comment: The alarms are not used on permanent links. The "Call" check box should not be used for a permanent link.

Note 1: The measurements cannot be saved in the internal event log.

Note 2: The Modbus protocol of the T200 does not enable measurements to be saved in the protocol event stack. It is therefore no use checking the "Events" box for this protocol.

The solution for retransmitting the measurements in Modbus protocol is:

- On a permanent link: They will be read during the next interrogations coming from the Supervisor. There is therefore nothing special to do.
- On a non-permanent link: Check the "Call" box to retransmit it immediately (or after the configured period), or wait for the next interrogation by the Supervisor.

■ Threshold treatment:

| Parameter | Description |
|----------------------|--|
| "Log" check box: | Check this box to activate saving of the measurement in the measurement log according to the criteria configured below. |
| High threshold: | Check the box to activate saving of the measurement upon exceeding the high threshold. |
| High threshold value | Configure the high threshold value which will cause processing of the defined records. |
| Low threshold: | Check the box to activate saving of the measurement upon exceeding the low threshold. |
| Low threshold value | Configure the low threshold value which will cause processing of the defined records. |
| "Dial up" check box: | Check this box to activate saving of the measurement in the alarm log and sending of a frame to the Supervisor according to the threshold criteria configured above. |

Comment: The alarms are not used on permanent links. The "Call" check box should not be used for a permanent link.

Note 1: Same as for previous section.

Note 2: Same as for previous section.

■ Dead band:

| Parameter | Description |
|----------------------|---|
| "Log" check box: | Check this box to activate saving of the measurement in the measurement log according to the % criterion configured below. |
| Value in %: | Configure the minimum measurement variation percentage which will cause processing of the defined records. |
| "Event" check box: | Check this box to activate saving of the measurement in the protocol event stack according to the % criterion configured above. (see notes 1 and 2 below) |
| "Dial up" check box: | Check this box to activate saving of the measurement in the alarm log and sending of a frame to the Supervisor according to the % criterion configured above. |

Comment: The alarms are not used on permanent links. The "Call" check box should not be used for a permanent link.

Note 1: Same as for previous section.

Note 2: Same as for previous section.

■ Min. and Max. recording:

| Parameter | Description |
|-----------------------------|---|
| "Maximum active" check box: | Check this box to activate saving in the measurement log of the maximum value reached in the period configured below. |
| "Minimum active" check box: | Check this box to activate saving in the measurement log of the minimum value reached in the period configured below. |
| Period value: | Can be used to configure the period for saving of the measurement in the measurement log. |

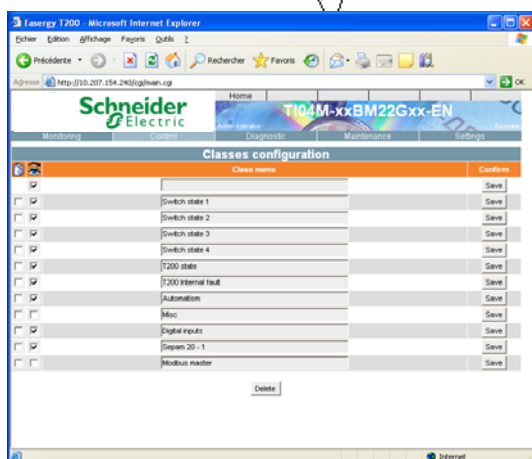
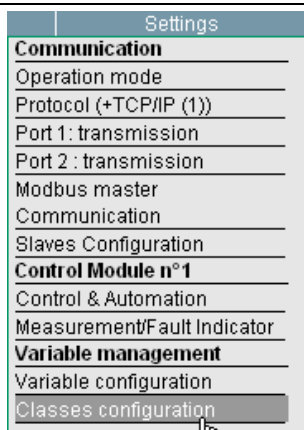
4.7.8 Summary of records in logs and stacks:

The following table summarizes the various possibilities for recording in the various logs and in the Supervisor event stack according to each type of variable:

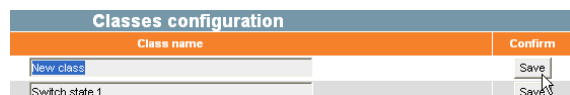
| Type | Event log | Alarm log | Measurement log | Protocol event stack |
|------|------------------------------------|------------------------------------|----------------------------|---|
| TSS | If corresponding check box checked | If corresponding check box checked | | Always |
| TSD | If corresponding check box checked | If corresponding check box checked | | Always |
| TM | | If "Dial up" check box checked | If "Log" check box checked | If "Event" check box checked (see note below) |

Note: For a TM, several measurement processing operations can be performed according to the type of transmission:

- **"Event" box only checked:** Saving of the TM in the protocol stack without call sequence to the Supervisor (general case of the permanent link, except in Modbus protocol).
- **"Event" + "Dial up" boxes checked:** Saving of the TM in the protocol stack and call to the Supervisor (general case of the non-permanent link).
- **"Dial up" box only checked:** Call to the Supervisor without saving of the TM in the protocol stack (specific case of the non-permanent link in Modbus protocol).



Class configuration page



Creation of a new class



Check boxes: "Deletion" and "Monitoring"

| Label | Status |
|-----------------------------|--------|
| Switch state 1 | |
| Switch state | Closed |
| Ground disconnecting switch | Opened |
| MV Presence | No |
| Residual voltage | No |
| Voltage absence | No |
| Voltage | 0 V |

Example of variables associated with a class
Excerpted from the page: "Monitoring"

4.8 Customization of T200 classes

Access: "**Settings/Classes configuration**" page.

4.8.1 Definition of classes

A class allows the T200 variables to be grouped in various categories in the monitoring and control pages of the Web server (e.g. "Monitoring" and "Control" pages), so as to make the data display clearer.

Note: The variable configuration page also adopts the same organization of variables by class.

4.8.2 Classes configuration

The factory configuration settings of the T200 include by default a number of classes.

However, it is possible to modify this configuration to customize the display of the variables in the pages.

The "**Settings/Classes configuration**" page can be used to create a new class, or to modify or delete an existing class.

□ Creating a class:

To create a new class, simply enter its name in the empty "Class name" field and click on the associated "Save" button.

Once the class has been created, it is then possible to configure a variable of the T200 to be attached to that class (see chapter on "*Customization of T200 variables*").

□ Modifying a class:

Modification concerns only the change of class name or the possibility of making a class visible or invisible in the pages of the Web server.

To modify the name of a class, simply change the title in the class entry field and click on the associated "Save" button.

A specific check box can be used to define whether a class and the variables associated with that class will be visible in the monitoring pages ("Monitoring" and "Control" pages).

Selection of this check box and a click on the "Save" button makes the class visible in the pages (and conversely for deselection).

□ Deleting a class:

A specific check box in the page can be used to delete an existing class.

Selection of this check box and a click on the "Delete" button permanently erases the selected class.

Note: It is not possible to erase a class if variables are still attached to that class.

4.9 Tests at commissioning

During the tests, a microcomputer designed for configuration of the T200 can remain connected to the Communication module. It can be used to monitor the status of the equipment, time-stamped events and communications sent over the internal Modbus link.

Commissioning sheet ref. N1030 can be used.

See the "Operation" chapter for more information concerning the operation of the Easergy T200.

"Local/Remote" switch set to "Local"

- Check that the PC has taken the "local equipment" information into account.
- Check that the MV cubicle switchgear is operating correctly, for example that each channel can open and close and that the positions of the switches correspond to the status of the indicator lamps.
- Check "locked" information (earthing switch):
Check that the equipment has taken the "locked" inputs into account.

"Local/Remote" switch set to "Remote"

- Check that the status of the MV cubicles is correctly displayed on the control station.
- Check that the cubicle connecting cables are correctly marked and disconnect them: a remote alarm is generated after a one-minute time-out.
- Check that the HA10 cubicle connectors are fitted with polarizing pins.
If you have dummy devices, install them on the HA10 connectors to ensure that neither the battery nor the MV cubicle is overloaded.
- Telecontrol order check:
 - Check that each order processed by the remote control station is correctly transmitted and executed by the equipment, for example that each channel can open and close.
 - Check that the switch position information received at the remote control station corresponds to the status of the indicator lamps.

■ "Digital inputs" check:

Check that the equipment has taken the "Digital inputs" into account and that the indications have been forwarded to the remote control station.

■ Check the internal fault current detection function:

The "Test" pushbutton on the Control module activates the notifications corresponding only to those channels for which Current Acquisition cards are installed.

Note: A current simulator supplied as an optional extra can be used for this check. It performs a complete test of the acquisition system.

Disconnect the dummy devices and reconnect the cubicle connecting cables to their HA10 connector (polarization).

■ Telecontrol order check:

- Check that each order processed by the remote control station is correctly transmitted and executed by the equipment, for example that each channel can open and close.
- Check that the switch position information received at the remote control station corresponds to the status of the indicator lamps.

■ Check "locked" information (earthing switch):

Check that the equipment has taken the "Locked" inputs into account and that the notifications have been forwarded to the remote control station.

■ "AC supply OFF" alarm check:

Open the AC supply fuse block. The remote alarm is generated immediately, or after the configured time-out.



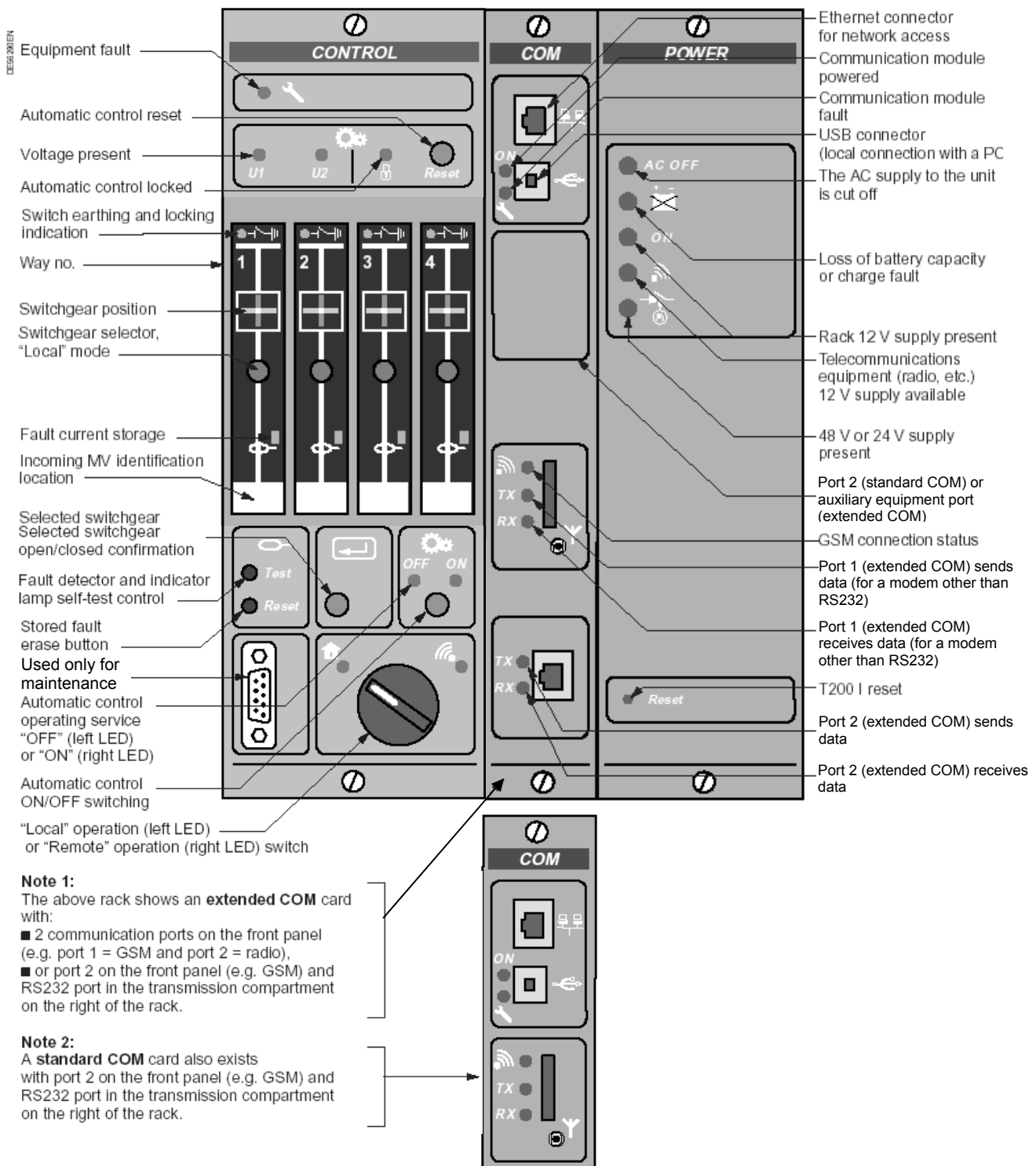
IMPORTANT NOTE: These tests can store time-stamped events. Remember to erase them from the configuration PC.

See "Operation" for a step-by-step description of the various transmission stages indicated by the LEDs on the front panel of the Communication module.

5 Operation

5.1 Operating mode

Easergy T200 I can be used locally via the Control module or remotely from a remote control station, depending on the position of the "Local/Remote" switch. An indicator lamp showing the status of the equipment is located at the top of the control panel (front panel of the Control module). A PC can be connected to the "COM" module to provide further information about the status of Easergy T200 I and its operating history.



5.2 Accessibility

Level 0: Operator access

All the Easergy T200 I indications can be seen through the window in the door. No commands can be accessed at this level.

Level 1: Operators can access commands by sliding the transparent panel

- Switching from "Remote" mode to "Local" mode and vice versa.
- Automatic control ON/OFF switching.
- Switch opening/closing.
- Testing of the fault detection system.
- Resetting of fault memories.

Level 2: Maintenance staff can access all functions by opening the enclosure door.

5.2.1 Switch control

The switches can only be controlled via the Control module if:

- The "Local/Remote" switch is set to "Local";
 - 24 V/48 V voltage is present;
- When an order is implemented, the switch moves to the complementary position:
- If a switch is off, a switch-on order can be given.
 - If a switch is on, a switch-off order can be given.

5.2.2 Other orders

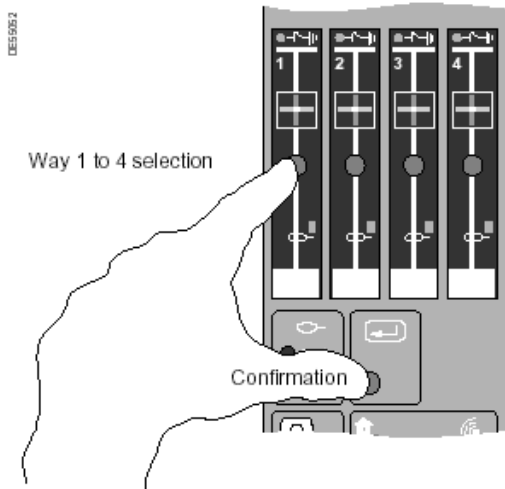
The Power supply module is used to reset the power supply:

- It can reinstate the "Telecoms supply" when this output has been cut off due to overconsumption.
- It can reinstate the supply to the equipment after it has been switched off due to an excessive drop in the 12 V supply.

5.2.3 Testing of indicator lamps and fault detection

On the Control module, a stored fault current is shown by a red indicator lamp included in each channel block diagram.

- A "Test" pushbutton is used to trigger simultaneous testing of all the control panel indicator lamps and at the same time testing of fault detection acquisition systems.
 - So long as the "Test" button is held down, all the CONTROL panel indicator lamps remain lit. This allows indicator lamp operation to be checked.
 - When the "Test" button is released, all the indicators go out except the channel indicator lamps which remain lit for 3 seconds, for channels on which current acquisition modules are detected.
- A lit indicator lamp indicates that fault detection is functioning on the channel (simulation of phase-to-phase and phase-to-earth current faults with fictitious 750A current).
- The "Reset" pushbutton is used to erase stored fault currents.



To ensure that a switch cannot be activated or deactivated accidentally and that no operations are performed at the wrong time, an order cannot be implemented locally unless the pushbutton corresponding to the way to be controlled and the confirmation pushbutton are pressed simultaneously.

6 Maintenance

General

The equipment does not require regular maintenance.

The integrated battery test keeps users informed of the battery availability status.

Note: Replacement fuses are provided in the “accessories” bag attached inside the basic enclosure.

The T200 has certain tools to perform maintenance or fault finding on the equipment.

This requires a PC-compatible microcomputer with Internet Explorer (or an equivalent software) installed. It is then possible to read the internal states of the equipment and the events stored in memory by the T200 (see also section on Commissioning).

The tools available for maintenance and fault finding are as follows:

Monitoring page

The screen on the left represents an example of a 4-channel Easergy T200 I, with internal fault detection option.

This menu allows viewing of all the states and information managed by the T200:

- **The switch state:** “Open”, “Closed” or “locked”;
- **Stored fault currents:** “I Max.” and “I Max. transient” on each phase;
- **Current measurement** on each phase;
- **The automatic control status,** ON or OFF;
- **Equipment internal faults;**
- **The operating mode:** local or remote;
- **AC supply OFF, Delayed AC supply OFF;**
- **Digital input status.**

Comment: The indications are refreshed every second.

Consulting the logs

The various logs available (events, alarms and system) make it possible to know the history of everything that has occurred on the T200.

This can be useful to find the cause of a fault during fault finding.

■ All the events displayed in the logs are time stamped so as to know the date of origin of a fault.

■ Given the large number of time-stamped events saved, it is possible to go back sufficiently far in time to trace the cause of a problem.

When the maximum number is exceeded, the oldest event on the list is erased by the most recent one.

■ The logs can be saved on PC in the form of Excel-compatible files so as to be able to perform fault finding, reviews or statistics later.

■ The logs can be transferred by e-mail so as to be able to forward the report on a problem to an accessory department or person or possibly to exchange an opinion with the manufacturer of the T200.

Indicator lamp indications

The T200 provides a certain amount of information via the indicator lamps on the front panel of the rack modules (see section on Operation – Control and monitoring).

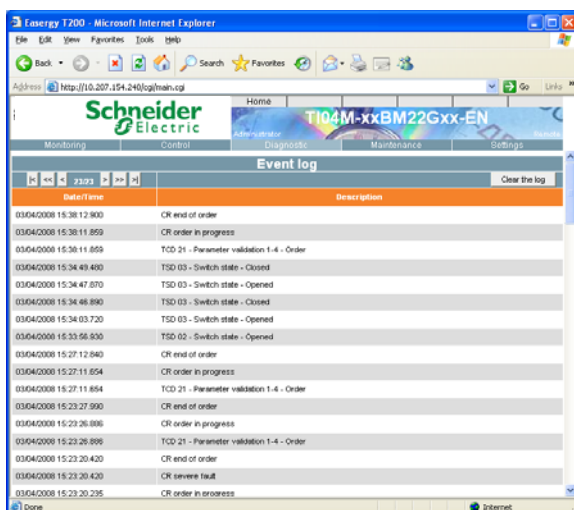
These indicator lamps provide information concerning the operating state of the T200 and concerning the presence of any fault, where applicable.

Comment: A diagnostic through the state of the indicator lamps on the front panel is not always adequate to find the cause of a fault. A lit indicator lamp indicates the presence of a fault, but it is often necessary to consult the logs or the “Monitoring” page to determine precisely the cause of a fault.

For more information, consult the diagnostic table below.



Monitoring page



Event log

6.1 Diagnostics via the front panel indicator lamps and logs

| Symptoms | Possible causes | Solutions | Log* |
|--|---|---|--|
| The "Equipment fault" LED on the Control module is lit. (you are advised to connect a PC to the Control module to determine the cause of the fault: "Equipment states" menu) | Easergy T200: no communication between the Control module and the Communication module | Replace the Control module and/or the Communication module | Modbus communication fault |
| | The battery charger output voltage is too high or too low | Check the charger and the battery. If necessary, replace the Power Supply module and/or the battery | Charger fault |
| | No power supply to the switchgear | See "48 V LED extinguished" in the symptom column below | Motorization power supply failure |
| | Loss of battery capacity or charge fault | See "Battery fault LED lit" in the symptom column below | Battery fault |
| | No telecommunications power supply (Radio or Modem) | See "external 12 V LED extinguished" in the symptom column below | Accessory equipment power supply failure |
| | Problem on the Control module | Connect the PC to the COM module and consult the logs. Configuration loss: Reconfigure the T200. Other faults: perform resetting on the power supply card. If the fault persists, replace the CPU card. | Configuration loss or memory fault or program error or parameter error |
| | Faulty measurement card | Replace the CPU card. | Fault detector card fault |
| | The Control module software is faulty | Press the key Reset on the Power Supply module. If the LED does not go out after a few seconds, replace the CPU card. | |
| The "AC supply OFF" LED on the front panel of the Power Supply module is lit AC OFF | AC supply fuse blown | Replace the gF type 2 A HRC fuse, 10 x 38 mm, in the lower enclosure panel. | Power supply failure |
| | The output connector of the mains fuse holder is disconnected | Put the connector back in place on the power supply card. | Power supply failure |
| | No supply to the enclosure | Connect the AC supply. | |
| | Enclosure power supply cut off automatically due to prolonged AC supply outage | Check the cause of the AC supply outage. If the AC supply remains OFF, run another supply cycle by pressing the Reset button on the Power Supply module. If the power supply does not restart, change the Power Supply module and/or the battery. | |
| | Temporary AC supply outage | Wait for the AC supply voltage to be reinstated (the enclosure is now running on battery) | Power supply failure |
| The "Battery fault" LED on the front panel of the Power Supply module is lit | Loss of battery capacity or charge fault | Check that AC supply is ON and that the charger is supplying 12 V. To do this, disconnect the battery and measure the voltage on the rack battery connector. If the voltage is null, replace the Power Supply module. Otherwise, after reconnecting the battery, reset the Power Supply module to trigger a battery test; if the problem recurs after charging for 24 hours, replace the battery. | Battery fault |
| The "Rack 12 V" LED on the front panel of the Power Supply module is extinguished | Fuse blown | Replace the 5 x 20 mm, 0.8 A semi time-lag fuse on the Power supply module. | |
| | If the "AC supply OFF" LED is lit, the enclosure supply has been cut off automatically due to a long AC supply outage | Check the cause of the AC supply outage. If the AC supply remains OFF, run another supply cycle by pressing the Reset button on the Power Supply module. If the power supply does not restart, change the Power Supply module and/or the battery. | |
| | Enclosure power supply cut off automatically due to a drop in the 12 V voltage | Check the charger and the battery. If necessary, replace the Power Supply module and/or the battery. | |
| | Power Supply module failure | Replace the Power Supply module. | |

(*) The events can be consulted in one or more of the various available logs:

- Event log;
- Alarm log;
- System log.

In these logs, the information appears in the form "TSSxx - Information (log column) - Fault".

| Symptoms | Possible causes | Solutions | Log* |
|--|---|---|--|
| The "external 12 V" LED on the front panel of the Power Supply module is extinguished | Fuse blown | Replace the 5 x 20 mm, 0.4 A semi time-lag fuse on the Power Supply module. | Accessory equipment power supply failure |
| | Consumption at the output > 1.3 A ± 0.3 A for 3 min | Check the transmission equipment and reinstate the supply by pressing the Reset button on the Power supply module. | |
| | If the "AC supply OFF" LED is lit, the enclosure supply has been cut off automatically due to a long AC supply outage | Check the cause of the AC supply outage. If the AC supply remains OFF, run another supply cycle by pressing the Reset button on the Power Supply module. If the power supply does not restart, change the Power Supply module and/or the battery. | |
| | Enclosure power supply cut off automatically due to a drop in the 12 V voltage | Check the charger and the battery. If necessary, replace the Power Supply module and/or the battery. | Accessory equipment power supply failure |
| | Power Supply module failure | Replace the Power Supply module. | |
| The "48 V" LED on the front panel of the Power Supply module is extinguished | Fuse blown | Replace the 5 x 20 mm, 5 A time-lag fuse on the CPU card of the Control module in the left-hand part of the enclosure. | Motorization power supply failure |
| | 2-pin connecting cord (rack backplane/Interface card disconnected) | Connect the cord to the rack backplane and to the Interface card. | |
| | Ribbon cable disconnected | Connect the ribbon cable to the rack backplane and to the Interface card | |
| | If the "AC supply OFF" LED is lit, the enclosure supply has been cut off automatically due to a long AC supply outage | Check the cause of the AC supply outage. If the AC supply remains OFF, run another supply cycle by pressing the Reset button on the Power Supply module. If the power supply does not restart, change the Power Supply module and/or the battery. | Motorization power supply failure |
| | Motorization power supply cut off automatically due to a drop in the 48 V voltage | Check the charger and the battery. If necessary, replace the Power Supply module and/or the battery. | |
| | Power supply cut off following overheating of the power supply card charger (e.g. excessive power consumption on the motorization 48 V) | Following the 48V cutoff, if the temperature of the charger drops in less than one minute, the 48V power supply returns automatically. On the other hand, if the temperature does not drop 1 minute after the 48V cutoff, a manual reset should be performed on the power supply card to restore the 48V power supply (thermal protection requiring action). If the problem persists, replace the power supply card. | |
| | T200 CPU card failure | Replace the T200 CPU card. | |
| | Power Supply module failure | Replace the Power Supply module. | |
| All the Control module indicator lamps are extinguished | Interface card failure | Replace the Interface card. | Motorization power supply failure |
| | The equipment is not powered up | Power up the equipment. | Interface or modem initialization error (x) / Control Module error (x) |
| | Supply fuse blown | Replace the 5 x 20 mm, 0.8 A semi time-lag fuse on the Power supply module. | |
| | Control module failure | Replace the Control module. | |
| The Communication module "ON" LED is extinguished | The card program is no longer running | Reset by pressing the Reset button on the Power Supply module. | RESET |
| | The equipment is not powered up | Power up the equipment. | |
| The Communication module "Fault" LED is lit | Supply fuse blown | Replace the 5 x 20 mm, 0.8 A semi time-lag fuse on the Power supply module. | Interface or modem initialization error (x) / Control Module error (x) |
| | Configuration problem on one of the COM or CONTROL modules or internal connection fault between the modules | Connect the PC to the COM module. Refer to the system log to determine the error. Check the conformity of configuration of the COM and/or CONTROL modules of the T200 (example of fault: incompatibility of the configured modem with that installed on the COM card or internal connection problem between one of the CONTROL modules and the COM module). If the fault persists, replace the module presumed to be defective. | |
| The Communication module "Fault" LED flashes rapidly | The Communication module software is faulty, or starting with USB cable connected. | Stop the USB driver, disconnect the USB cable from the Communication module, then press the Reset key on the Power Supply module. If the LED does not go out after a few seconds, replace the Communication module. | RESET |
| The Communication module "Fault" LED flashes slowly | The Communication module software is faulty | With the USB cable disconnected and the USB driver stopped, press the Reset key on the Power Supply module. If the LED does not go out after a few seconds, replace the Communication module. | |

Other diagnostics

| Event | Possible causes | Solutions |
|-------------------------------|-----------------------------------|---|
| Operation orders not executed | The switch order was not executed | Check: <ul style="list-style-type: none">■ the position of the “Local/Remote” switch;■ the validity of the order issued;■ the connection between Easergy T200 and the switches. |

6.2 Power supplies

Powering down the equipment:

- **Switch off the AC supply** outside the equipment or on the safety fuse block within the enclosure.
- **Disconnect the supply to the battery circuit:**
Unplug the battery connector under the rack.
All the LEDs on the front panels of the rack should now be extinguished.
The Easergy T200 I enclosure is now powered down.



Toroid safety precautions

The toroid connectors are IP2x; switching off the current sensors temporarily (< 10 min) involves no particular danger.



IMPORTANT NOTE: There is no need to alter the cables when connecting the toroid and power supply cables to the cubicle. The cables must never be modified.

Battery maintenance:

Replacing the battery

Before carrying out any work on the battery, disconnect it from the equipment by unplugging the connector from the base under the rack.
Remove the battery by sliding it outwards, raise the terminal covers and undo the two terminal nuts, then disconnect the Faston lugs from the connecting cord.
To install a new battery, repeat this sequence in the reverse order.

Servicing and storing the batteries

Sealed lead batteries are used. The advantages of this type of battery include the fact that there is no risk of explosion, no acid leakage and no servicing requirement.

However, this type of battery has its limitations:

- Limited number or recharging cycles;
- Average service life of 10 years, with ageing accelerated by temperatures outside the recommended range;
- Ageing during storage (do not store for more than six months without recharging, as this type of battery does not withstand a total discharge);
- Difficult to predict the end of battery service life.

The Power Supply module is designed to optimize the characteristics of the battery.
A battery fault alarm informs the remote control system of an imminent discharge.

Replacing fuses

Replacement fuses are provided in the "accessories" bag attached inside the basic enclosure.

▪ "AC supply" fuse

This fuse is located in the lower panel of the enclosure.
gG type HRC fuse of rating **4 A**, 10 x 38 mm.

▪ "Rack power supply" fuse

The fuse protecting the power supply to all the electronic modules is located on the Power Supply module card.
Fuse: 5 x 20 mm, **0.8 A (2 A for T200 ≥ 12-channel)** semi-time-lag.

▪ "External 12 V supply" fuse

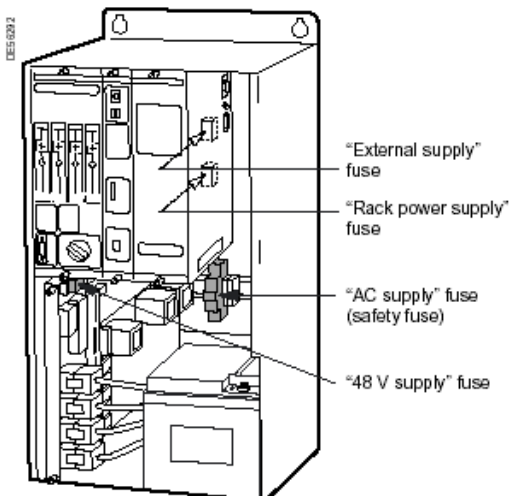
The fuse is located on the Power Supply card.
Fuse: 5 x 20 mm, **4 A** time-lag.

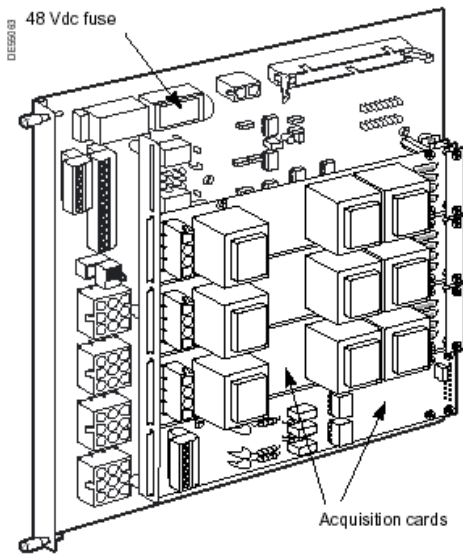
▪ "48 V supply" fuse

The fuse is located on the relay interface card.
This card is located in the lower left-hand part of the enclosure.
Fuse: 5 x 20 mm, **5 A** time-lag.

To replace the fuses:

- a) Power down the enclosure.
- b) Replace the defective fuse.
- c) Power up the enclosure.





The fuse located on the Power supply card protects the 12 V supply to the entire rack.

6.3 Card replacement

Servicing the Interface card

Purpose: To replace the 48 Vdc fuse or add/replace a Fault Current Acquisition card.

- Power down the enclosure (see the previous page).
- Release the two locking screws from the front of the card.
- Pull it a few centimetres out of its slot.
- Disconnect the card connectors in the following order:
 - ☐ Phase toroid connectors (X1 to X4), unlocking them by squeezing the two side levers;
 - ☐ Cubicle connectors (J6 on the 1-way T200, J8 to J11 on the 4-way T200), unlocking them by squeezing the two side levers;
 - ☐ Rack connector (J2 for the 1-way T200 or J1 for the 4-way T200), by separating the two levers at each end of its base;
 - ☐ Switch supply connector (J1 for the 1-way T200 or J2 for the 4-way T200), unlocking it by squeezing the two side levers;
 - ☐ Digital input/output connectors (J8 for the 1-way T200 or J12 for the 4-way T200).
- The card is now completely disconnected and can be removed from its slot. To install a new card, reverse the operations described above, then power up the enclosure.

Installing a current, voltage or digital acquisition card

- Power down the enclosure (see the previous page).
- Remove the Interface card (see above).
- Place the Acquisition card in position and secure it with the two screws.
- Replace the Interface card.
- Power up the enclosure.

Replacing the Power Supply module

- Power down the enclosure (see the previous page) and disconnect the Battery and Mains connectors on the underside of the card.
- Release the two locking screws on the Power Supply module and remove it from its slot.
- Insert the new module, locking it in position.
- Reconnect the Battery and Mains connectors to the underside of the card and power up the enclosure.

Replacing the Communication module

- Power down the enclosure (see the previous page).
- Release the two locking screws and remove the Communication module from its slot.
- Insert the new module, locking it in position.
- Power up the enclosure.

IMPORTANT: remember to configure the module; see "Commissioning".

Replacing the control panel or the T200 CPU card

Purpose: To replace the control panel or the T200 CPU card or add/replace the measurement card.

- Power down the enclosure (see the previous page).
- Release the two locking screws on the front panel of the Control module.
- Disconnect the ribbon cable from the rear of the front panel by separating the two levers on each side of the connector base.
- If necessary, remove T200 CPU card from its slot.

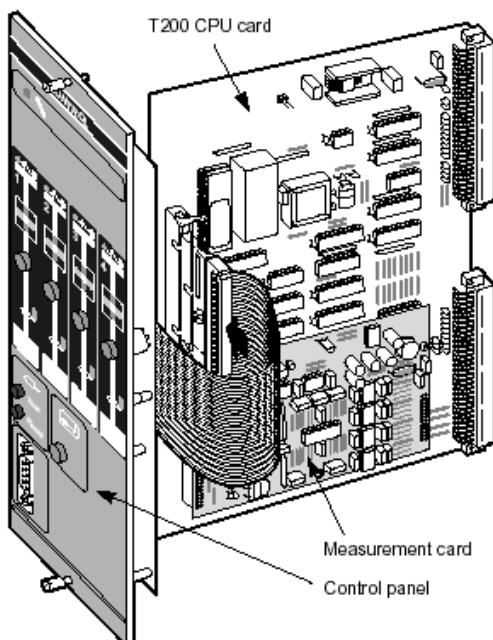
Installing the T200 CPU card

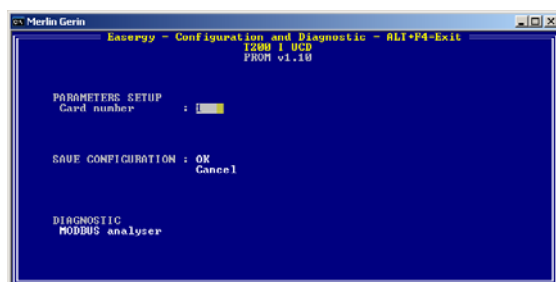
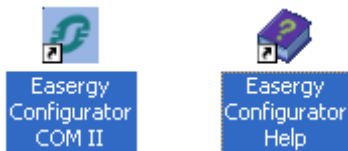
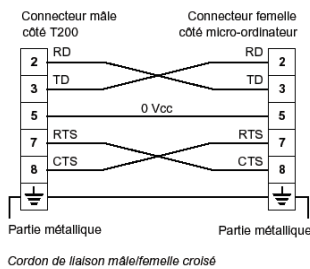
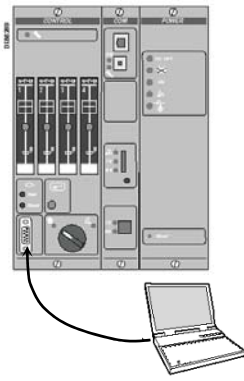
- Push the new T200 CPU card firmly home.
- Attach the end of the ribbon cable from the control panel to the connector on the T200 CPU card.
- Screw the control panel firmly into position.
- Power up the enclosure.

Installing the measurement card

- Plug the measurement card into the T200 CPU card and secure it with the screw.
- Install the T200 CPU card and the control panel (see above).
- Power up the enclosure.

IMPORTANT: remember to configure the module; see "Commissioning".





6.4 CPU card software configuration

Each CPU card physically present in the rack(s) of the T200 is configured in factory with a specific internal Modbus address depending on its location. This address allows the CPU cards in the enclosure to be identified for exchange of equipment internal information in Modbus protocol between the "CONTROL" modules (slaves) and the "COM" module (master).

When replacing a T200 CPU card following a maintenance operation, it is essential to configure the internal Modbus address of each CPU card which will take the place of an old card.

Connection to the T200:

To configure the Modbus address on the CPU card of the T200, the following items are required:

- A microcomputer having an RS232 serial port and running under MS-DOS;
- The "Easergy Configurator COM II" software supplied on the Easergy CD delivered with each T200;
- A PC-T200 connection cord (the same as that used on old-generation T200s having only a 9-pin RS232 serial port on the communication card for configuration).

Installing the CONTROL Module Configurator:

Comply with the following instructions to install the configuration software on the PC:

- With the microcomputer powered up, insert the "Easergy Configurator" CD-ROM in the PC drive; a window then automatically appears on screen.
- Click on the "T200 Serie 3" option.
- Then click on the "Installation" option in the "CONTROL module configurator" section.
- Wait for installation to end ("Installation is finished" window), then click on "Ok".
- The software is then installed on the PC and two specific shortcuts are created on the PC desktop (a software starting icon and a Help icon).

Connecting the PC to the CONTROL module:

- Plug one end of the connection cord into the serial port (COM1) of the computer and the other end into the CONTROL module of the T200, on the 9-pin serial connector on the front panel.
- Double-click on the configurator starting icon on the PC desktop.
- The available starting language is proposed: type "Enter" to choose English (the only language available for this software).
- The main menu of the configuration software appears on screen.

Software operation:

- Modifications to the configuration data can only be taken into account after they are confirmed in the "Save configuration" field.
- Click on "Cancel" to view the previous parameters again.
- The area in which the cursor is positioned is highlighted.
- The "arrow keys" and the "tab" key are used to move from one data entry field to another.
- A highlighted area can be selected by pressing "Enter" or the "Space bar".
- A parameter value can be modified via:
 - the "+" key or the "Space bar" to increase the value;
 - the "-" key to reduce the value.
 - Press "Alt" and "F4" simultaneously to exit the main menu.

Modbus address configuration:

Once the software has started and connection is established with the equipment (configuration menu displayed), perform the following operations:

- Configure the CPU card number in the "Card number" field depending on the CONTROL module, on which the CPU card depends, that is to be configured:
 - CONTROL module controlling channels 1 to 4: number = 1
 - CONTROL module controlling channels 5 to 8: number = 2
 - CONTROL module controlling channels 9 to 12: number = 3
 - CONTROL module controlling channels 13 to 16: number = 4
- Confirm the configuration in the "Save configuration" field.





Note: After saving the configuration, if "**Bad card number**" appears on the first line of the menu, this means that an incorrect number has been configured or there is a gap in the card numbers (e.g. No. 1 and 3 configured but number 2 missing).

NB: If two CONTROL modules have been configured with the same number, the T200 will not be able to operate correctly, because the COM card will detect an internal Modbus address conflict.

The red "Fault" indicator lamp on the COM card of the T200 will then light to indicate the occurrence of a configuration problem.

7 Appendix A – Configurable parameters

□ Definition of access levels according to the patterns in each box in the table:

| | |
|---|--|
| Pattern  | : Accessible or modifiable as User, Operator or Administrator |
| Pattern  | : Accessible or modifiable only as Operator or Administrator |
| Pattern  | : Accessible or modifiable only as Administrator |
| Pattern  | : No access (read-only) or non-existent |

| Page: Home | | | | |
|------------|--------------------|--------------------|--|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| | | Home | | Back to home page |
| | | Local/Remote | Local/Remote | Local: normal access. Remote: simplified access (images and logos not loaded) |
| | Choice of language | Language | Français/ English/Português/Es pagnö/Deutsch | |
| | User | User name | No restriction | Confirmation by OK (by default: "Easergy") |
| | | Password | No restriction | Confirmation by OK An incorrect user or password opens a "User" session (by default: "Easergy") |

| Page: Monitoring | | | | |
|------------------|---------|----------------------|---------------------|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| | Classes | Channel x | | Access to the corresponding class states |
| | | T200 information | | Access to the corresponding class states |
| | | T200 internal faults | | Access to the corresponding class states |
| | | Automatic controls | | Access to the corresponding class states |
| | | Digital inputs | | Access to the corresponding class states |

| Page: Control | | | | |
|---------------|--------------------|--------------------|---------------------|---|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| | Channel X | F-O control | | Allows the switch status to be changed |
| | T200 information | DDEF reset control | | Allows resetting of the fault detector memory |
| | Automatic controls | ON/OFF control | | Allows the automatic control status to be changed |

| Page: Diagnostic | | | | |
|------------------|---------|--------------------|---------------------|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Alarm log | | Clear log | | The "Ack" box is checked when the SCADA system has acknowledged the alarm The "Clear log" button clears the log's content |
| Event log | | Clear log | | The "Clear log" button clears the log's content |
| System log | | Clear log | | The "Clear log" button clears the log's content |
| Measurement log | | Clear log | | The "Clear log" button clears the log's content |
| File transfer | | Alarms.csv | | Transfers the alarms log in Excel file form "Save" saves the file to the PC "Open" opens the file under Excel |
| | | Events.csv | | Same as for the events log |
| | | System.csv | | Same as for the system log |
| | | Measures.csv | | Same as for the measurements log |

| Page: Maintenance | | | | |
|--------------------------------|----------------------------------|---------------------------------|--|---|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Terminal | General | Name of terminal | No restriction | At the user's choice |
| | | Date format | DD/MM/YYYY MM/DD/YYYY YYYY/MM/DD | Defines the date format to be displayed in the logs |
| | | Date/time of last config. | | Consultation exclusively |
| | | Configurator structure version | | Consultation exclusively |
| | Control module X | Application | | Manufacturer information. Consultation exclusively |
| | | Date/time of last configuration | | Manufacturer information. Consultation exclusively |
| | | Application version | | |
| | | Measurement processor version | | |
| Software | Software information | Hardware configuration | | |
| | | Save | | Takes into account the change |
| | | All displayed parameters | | Name of software, version, date and time of compilation, type of compression, size, CRC32. Consultation exclusively |
| | | Software 1 | Checked or not | Selection of software 1 |
| | | Software 2 | Checked or not | Selection of software 2 |
| Clock | Terminal date/time | Download software | | Allows the T200 software to be updated |
| | | Date | Consistent date format (year > 2000) | |
| | | Time | Consistent time format | |
| | | Update | | Allows the T200 date and time to be updated manually |
| | | Synchronization | | Allows the T200 date and time to be updated automatically by the PC |
| IP parameters | Ethernet interface | Mac address | | Unique identification address for each T200, set in factory. Consultation exclusively |
| | | DHCP | Active Inactive | Defines whether the server of the Ethernet local area network can allocate automatically on connection an IP address to the T200 (active) or not (inactive) |
| | | IP address | Consistent IP address | Ethernet IP address of the T200 (by default: 172.16.0.5) |
| | | Sub-network mask | Consistent mask | The mask enables (0) or inhibits (255) the choice of accessible IP address values (by default: 255.255.255.0) |
| | | Gateway addresses | Consistent IP address | IP address of the server's Ethernet gateway. The gateway centralizes all the network IP accesses (by default: 172.16.0.1) |
| | | Primary DNS server | Consistent IP address | IP address of the primary DNS server (Domain Name Server). The DNS enables the IP addresses to be associated with the website names (by default: 172.16.0.1) |
| | | Secondary DNS server | Consistent IP address | IP address of the secondary DNS server (Domain Name Server). Backup DNS server (by default: 0.0.0.0) |
| | USB interface | Server IP address | | IP address allocated to the T200's embedded Web server for USB access. Unmodifiable (by default: 212.1.1.10) |
| | | Client IP address | | IP address allocated to the PC connected via USB to the embedded Web server. Unmodifiable. (by default: 212.1.1.11) |
| | Communication interface | Server IP address | | IP address allocated to the T200's embedded Web server by the GPRS network operator. Unmodifiable. |
| | | Client IP address | | IP address allocated by the GPRS network operator to the client (Supervisor) which will log on to the T200 Web server. Unmodifiable. |
| IP server port | TCP services | Save / Cancel | | Allows changes to be saved/cancelled |
| | | HTTP server port | Valid port number | Port number for the HTTP server of the T200. (By default: 80). Any change of port No. implies indication with the IP address (e.g. 10.207.154.240:1500 for access with a port No. = 1500) |
| | | Telnet server port | Valid port number | Port number for the Telnet server of the T200. (By default: 23) |
| | | Port 1 trace server port | Valid port number | Port number for the port 1 trace server of the T200. (By default: 1168) |
| | | Port 2 trace server port | Valid port number | Port number for the port 2 trace server of the T200. (By default: 1169) |
| | | TCP/IP port trace server port | Valid port number | Port number for the TCP/IP port trace server of the T200. (By default: 1170) |
| User | | Save | | Allows changes to be saved |
| | | User name | No restriction | User name for the session |
| | | Password | No restriction | Password for the session |
| | | Type | Administrator Operator | The Administrator has full access The Operator has restricted access |
| | | Save | | Saves changes |
| | | Recycle bin | | Check box to select a session to be deleted |
| | | Delete | | Deletes an existing session if the corresponding box is checked |
| Port traces 1 and 2 and TCP/IP | Trace options | Start / Stop | | Start/Stop frame motion PC – T200 |
| | | Erase | | Erases the content of the trace |
| Backup / Restoral | Saves the terminal configuration | T200 -> PC arrow | | Allows the configuration to be saved on the PC in file form |
| | Loads the terminal configuration | PC -> T200 arrow | | Enables the configuration to be loaded on the PC from a file |

| Page: Settings | | | | |
|---|--|--------------------|--|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Operating modes General communication parameters | Communication parameters on physical ports | Port 1 or 2 mode | Depends on the protocol: - IEC: Unbalanced or balanced mode - DNP3: Unsolicited response or No unsolicited response - Modbus: Report by exception or No report by exception | Definition of transmission mode to be used: - Without alarms: "Unbalanced" or "Master/Slave" or "No report by exception" or "Unsolicited response". - With alarms: "Balanced" or "Master/Master" or "Report by exception". |
| | | Port 1 link | Not used Normal Duplicate Balanced – Normal/Backup Main – Normal/Backup Backup – Normal/Backup Store and Forward Test | - Channel not available - Main transmission channel. Two "normal" channels of different characteristics can be used if there are two control PCs (main and maintenance). The T200 cannot manage simultaneous TCDs coming from the two systems. - Two channels are declared in this mode. The two channels are identical. They both send and receive information. The first valid frame received is used for message processing. - Two channels are necessary in this mode. The operation of the channels is balanced. In the event of a fault on the channel in service, switchover to the other channel takes place automatically. - Requires another channel as "Backup – Normal/Backup". Same operation as "Balanced" but with the priority use of this channel. - Requires another channel as "Main – Normal/Backup". Same operation as "Balanced" but with use of this channel if failure of the Main channel. - Function used in radio mode. In addition to the normal channel function of transmission to the SCADA system, this channel is also used for relaying to an auxiliary T200 located within transmission range and not accessible by any other means. - (in radio mode only). Allows a fixed frequency to be generated on the radio network for antenna installation adjustment operations or level measurements on fields received on another T200 within range of the first. |
| | | Port 2 link | Same as Port 1 | Same as Port 1 |
| | | Port 1 medium | Direct RS232 (internal) Radio (external) 600/1200 FSK radio (internal) 600/1200 FSK LL (internal) PSTN (external) 1200/2400 FFSK (internal) PSTN (internal) GSM (external) GSM (internal) GPRS (internal) | - RS232 modem integral with COM card - For external radio with integral modem - FSK radio modem on COM card - FSK radio modem on COM card - For external PSTN modem accessible by Hayes command - FFSK radio modem on COM card - Internal PSTN modem on COM card - For external GSM modem accessible by Hayes command - Internal GSM modem on COM card - Internal GPRS modem on COM card |
| | | Port 2 medium | Same as Port 1 | Same as Port 1 |
| | Communication parameters on TCP/IP ports | TCP/IP port link | Not used Normal | - Channel not available - Channel used for transmission to the Supervisor via the Ethernet interface on condition that the protocol supports this transmission mode. |
| | | Save | | Allows the configuration to be taken into account |

| Page: Settings | | | | |
|---------------------------------|---|-------------------------------------|---|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Protocol | | | | Refer to the User Manual for the protocol used for more information concerning this configuration. |
| TCP/IP protocol | | | | Refer to the User Manual for the protocol used for more information concerning this configuration. |
| Port 1 or 2 Transmission | Direct RS232 or Radio or PSTN or GSM line or LL | Baud rate | 200 to 38400 baud 600 and 1200 baud only in FSK radio or FSK LL mode 1200 and 2400 baud only in FFSK radio mode | Frame transmission rate |
| | | Parity | None Space Even Odd | Transmission parity |
| | | Stop bits | 1 or 2 | Stop bit in frame |
| | | Frame error on noisy outgoing cable | Yes or no | The start of the frame can be filtered or not to avoid reading any noise |
| | | Frame error on line at rest | Yes or no | Any holes in the frame can be filtered or not |
| | | Delay before response | 0 to 10000 ms | In 10 ms increments. Upon reception, wait before sending the response to avoid frame overlapping (by default: 0 ms) |
| | | DTR management: | Checked or not | Data Terminal Ready. DTR is used by the T200 to indicate that it is ready for transmission |
| | | DTR - RTS delay: | 0 to 10000 ms | In 10 ms increments. Time delay to be complied with between rising of the DTR and RTS signals. In external radio, this corresponds to the time delay between the send order and carrier rise. (By default: 0 ms) |
| | | RTS management | Checked or not | Request To Send. If this option is selected, the RTS signal will be managed during transmission exchanges with the modem. |
| | | CTS management | Checked or not | Clear To Send. The modem enables the CTS as soon as ready after RTS enabling by the T200 |
| | | RTS to CTS delay | 10 to 10000 ms | In 10 ms increments. Time delay between receiving the RTS and sending the CTS by the modem (by default: 20 ms). |
| | | RTS (or CTS) to message delay: | 0 to 1000 ms | In increments of 10 ms. Time delay between rise of RTS (or CTS if managed) and sending the message. |
| | | Message to RTS delay | 0 to 10000 ms | In 10 ms increments. Time delay between the end of the message and RTS falling by the T200 (by default: 20 ms) |
| | | DTR management | Checked or not | Data Terminal Ready. The modem causes the DTR to rise after powering up or when it is Clear To Send |
| | | CD management | Checked or not | Carrier Detect. The carrier can be used by the modem to detect reception of a message. |
| | LL | Type of line | 2-wire or 4-wire | Choice of type of leased line used. |
| | PSTN or GSM | Calling party call delay | 1 to 600 s | Allows the call to be released when the T200 is called after the configured time delay (by default: 30 s) |
| | | Called party call delay | 1 to 600 s | Allows the call to be released when the SCADA system is called after the configured time delay. (By default: 60 s) |
| | | Telephone No. (normal) | 0 to 9, P, T or space | Main telephone No. to be used in case of alarm retransmission |
| | | Telephone No. (backup) | 0 to 9, P, T or space | Backup telephone No. to be used in case of alarm retransmission if main No. cannot be reached. |
| | | Modem init. sequence | No restriction. Record consistent AT commands | AT commands necessary to initialize the PSTN modem. With internal PSTN mode, default AT commands not modifiable. (By default: &F0%S0=12S0=1&K0%C0E0&W0&Y0) |
| | PSTN | Type of dialling | Pulse or voice frequency | Type of dialling used for alarm retransmission. |
| | GSM | PIN code | 0000 to 9999 | PIN code of the GSM card. |
| | | SMS service centre No. | 0 to 9, P, T or space | Telephone No. of the SMS service centre (gateway for SMS's) |
| | | User SMS No. | 0 to 9, P, T or space | Telephone No. of the user for sending SMS's. |
| | GPRS | Access point (VPN) | No restriction. | Name of GPRS access point provided by the GPRS network operator. |
| | | PIN code | 0000 to 9999 | PIN code of the GSM card. |
| | | Daily disconnection | Checked or not checked | Override setting of automatic disconnection/reconnection of the T200 to the GPRS network at a fixed time. In the event of loss of connection with the network, this process allows the T200 to reconnect, because it cannot do so by itself autonomously. |
| | | Disconnection time: | 0 to 23 | Configuration of the selected daily disconnection time according to the criteria described in "Daily disconnection". |
| | | IP address for ping | Consistent IP address, e.g. 192.168.2.169 | The ping makes it possible to verify and measure the quality of the equipment's connection with another device connected to the Ethernet network. Enter the known IP address of another device capable of receiving the packet corresponding to the ping allowing this quality to be measured. |
| | | Ping test | | Button that can be used to set the ping test manually to verify T200 connection to the GPRS network. The T200 then displays the result of the test: "Ping Ok" or "Ping failed". |
| | | Authentication | Checked or not checked | When the GPRS network requires authentication in the connection phase, activate this function by checking the box. Encryption protocols accepted: PAP, CHAP, MSCHAP, MSCHAP V2 |
| | | Login | No restriction | Configuration of the login used for authentication. Configure this field only if the "Authentication" option has been checked. |
| | | Password | No restriction | Configuration of the password used for authentication. Configure this field only if the "Authentication" option has been checked. |
| | | Save | | Allows the configuration to be taken into account |

| Page: Settings | | | | |
|--|-------------------------------------|--|--|---|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Control./ Autom. Automatic control No. x | Controls | Type of control | Standard PM6 CI2 Other | - Standard = Separate CO/CF controls - PM6 = Single CO/CF control on CO - CI2 = Control execution time at 100 ms - Other = Specific cubicle connection (e.g. RL27) |
| | | Time delay pending position return | 1000 to 30000 ms | In 100 ms increments. Waiting time for change of switch position following an order, before sending a telecontrol fault. (By default: 15000 ms) |
| | | Non-complementarity filtering time delay | 1000 to 30000 ms | In 100 ms increments. Waiting time for non-complementarity following a loss of switch state before sending a position fault (by default: 10000 ms) |
| | | Execution time delay (except PM6) | 50 to 15000 ms | In 50 ms increments. Switch motorization control relay rise time. Not used with a PM6 (by default: 2200 ms) |
| | Miscellaneous | Automatic control ON/OFF switching by channel | Checked or not checked | In standard use, automatic control is enabled or disabled generally on all the channels of a given CONTROL module. If this option is checked, the operation is performed channel by channel on this module. |
| | | 8-bit measurements | Checked or not checked | By checking this option, the T200 measurements are made compatible with the old-generation T200s coded on 8 bits (instead of 16 bits). |
| | | Switch TSS management | Several choices: - Standard - Earthing switch management by TSD - Free TSS - Specific mode 1 | Choice of mode of acquisition of the position coming from the switch: - Standard (factory settings). A single TSS used in this "Locked switch" mode (pin 7 of the 10-pin Harting connector). The presence of this TSS inhibits execution of orders on the switch. - Earthing switch management by TSD: An additional input (pin 8) allows the earthing switch to be managed as a TSD and not as a TSS. - Free TSS: Pins 7 and 8 normally assigned to "Switch locked" and "MV voltage present" can be used freely and used as mere DIs - Specific mode 1: similar to the "Earthing switch management by TSD" mode, with in addition the inhibition of orders when the T200 is in "Local" mode. |
| | Automatic control Channel x | Type of automatic control | None Sectionalizer Changeover switch BTA | - No automatic control - Opening on voltage dip due to fault - Power supply source changeover depending on the source available - Changeover automation with coupling possibility of sources |
| | Sectionalizer automatic control | Fault counter reset time delay | 20000 to 240000 ms | In 5000 ms increments Maximum waiting time to detect the number of faults configured before automatic control reset (by default: 30000 ms) |
| | | No. of faults authorized | 1 to 4 | Number of faults to be taken into account before opening upon automatic control action |
| | Changeover switch automatic control | Changeover delay time | 100 to 200000 ms | In 100 ms increments. Waiting time before changeover action if the conditions are required (by default: 1000 ms) |
| | | Time before normal channel return | 5000 to 60000 ms | In 1000 ms increments. Waiting time before switchover to normal channel upon channel voltage return. (By default: 10000 ms) |
| | | Operating mode | SW1->SW2 SW2->SW1 SW1<-> SW2 Auto SW1 Auto SW2 | Choice of changeover mode: - Switchover only from SW1 to SW2 - Switchover only from SW2 to SW1 - Switchover from SW1 to SW2 or vice versa - Ditto with priority return to SW1 if available - Ditto with priority return to SW2 if available |
| | BTA automatism | Choice of operating mode | Standard or Locking upon voltage loss | Automation operating mode: - Standard: When the voltage disappears on a downstream busbar, the automatic control system opens its incoming cable (SW1 or SW2) and closes SW3 (coupling). - Locking upon voltage loss: Ditto, but if the voltage disappears after changeover, SW3 is opened and the automatic control system is locked. |
| | | Automatic return SW1/SW2 | Yes or no | Defines whether the automatic control system allows return to the normal channel or not. |
| | | Time before changeover (T1) | 100 ms to 60 s | In 100 ms increments. Waiting time for stability of voltage loss before opening the channel |
| | | Waiting time before return (T2) | 5 s to 300 s | In 1s increments. Only if "automatic return SW1/SW2" option used. Waiting time for stability of voltage return on the normal channel before return to that channel. |
| | | Locking time upon voltage loss (T3) | 100 ms to 3 s | In 100 ms increments. Only for the "Locking upon voltage loss" mode. Waiting time for stability of voltage present on the backup channel. Otherwise, locking of automatic control. |
| | | Save | | Allows the configuration to be taken into account. |
| Measurements/ fault detector Measurement and fault detector No. x configuration | MV network characteristics Voltage | Nominal voltage | 50 to 30000 V | Nominal voltage (composed) of network to be configured. (By default : 20000V) |
| | | No voltage threshold | 20 to 95 % | Threshold of nominal voltage on network (in percentage) to define voltage dip (By default : 80%). |
| | | Residual voltage | 5 to 50 % | Voltage variation on one phase (in percentage) from the other phases for residual voltage indication (By default : 30%). |
| | MV network characteristics Current | I max. threshold | 100 to 750 A | In 50 A increments. I max. fault detection threshold (by default: 500 A) |
| | | Threshold IO | 5 to 25 A or 20 A to 160 A | In 5 A increments. Earth fault detection threshold. (By default: 20 A) |
| | | Time delay for detection | 50 to 500 ms | In 25 ms increments. Minimum time for detecting I _{max} . faults (by default: 200 ms) |
| | | Time delay for taking into account rapid I _{max} (all channels) | 50 to 200 ms | In 25 ms increments. Minimum time for detecting rapid I _{max} . faults. (By default: 50 ms) |
| | | Reset upon voltage return | Checked or not | Choice of fault detection storage resetting or not upon voltage return. (By default: checked) |

| Page: Settings | | | | |
|---|----------------------------|---|---|---|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Measurements/ fault detector | MV network characteristics | Detector reset time delay | 15 to 120 min. | In 15 min. increments. Time for fault detection storage resetting (by default: 120 min.) |
| Measurement and fault detector No. x configuration | Power supply functions | Time-delayed undervoltage indication delay | 0 to 21600 s | In 15 min. increments. Time delay for filtering the power supply undervoltage signal supplied by the power supply card. Allows indication of extended mains power supply failure. (By default: 7200 s) |
| | | Save | | Allows the configuration to be taken into account |
| Variable configuration Control configuration | General parameters | Variable name | No restriction | Name given to variable. |
| | | Type | Single or double | TCD = double control only |
| | | Access | Administrator Operator Monitoring | Access right for this variable. The variable will be readable or modifiable depending on the type of access configured and the associated access rights. |
| | | Order | Reverse or normal | The reverse choice reverses the order of the control bits for the TCD and the double telesignal (TSD) in the protocol frame to the Supervisor. E.g.: TCD and TSD on normal: bit 1 = opening, bit 2 = closing TCD and TSD on reverse: bit 1 = closing, bit 2 = opening (By default: Normal) |
| | | Class | (Complete list of all classes defined) | Allows a variable to be assigned to an existing class. |
| | | Logical address | | TCD internal No. assigned automatically by the T200 (unmodifiable). |
| | | Internal address | | Address for the COM-CPU internal Modbus link (unmodifiable). |
| | | Associated logical address TS | TSD1 to TSD40 or none | No. of the TSD associated with the TCD used by the T200 for reading the state. |
| | | External address | Format 'x' (e.g. 1) for all protocols except: - Modbus: 'x.x' (word, bit) - DNP3: 'x,x' (word, class) | External address used for retransmission of this TCD variable in the protocol link to the Supervisor. |
| | | Save | | Allows the configuration to be taken into account |
| | | Cancel | | Enables return to the preceding configuration |
| Variable configuration Indications configuration | Global parameters | Variable name | No restriction | Name given to variable. |
| | | Type | Single or double | TSD = double information TSS = single information |
| | | Logical address | | TSD internal No. assigned automatically by the T200 (unmodifiable). |
| | | Class | (Complete list of all classes) | Allows a variable to be assigned to an existing class. |
| | | Access | Administrator Operator Monitoring | Access right for this variable. The variable will be readable or modifiable depending on the type of access configured and the associated access rights. |
| | | Internal address | | Address for the COM-CPU internal Modbus link (unmodifiable). |
| | | External address | Format 'x' (e.g. 2) | External address used by SCADA for this variable |
| | | State definition: Active (1) | No restriction | Name displayed for an active state of the variable |
| | | State colour: Active (1) | Black, blue, green or red colour | Display colour for an active state of the variable |
| | | State definition: Inactive (0) | No restriction | Name displayed for an inactive state of the variable |
| | | State colour: Inactive (0) | Black, blue, green or red colour | Display colour for an inactive state of the variable |
| | | Other state: Undefined | No restriction | Name displayed for an undefined state of the variable (only with TSD and not with TSS) |
| | | State colour: Undefined | Black, blue, green or red colour | Display colour for an undefined state of the variable (only with TSD and not with TSS) |
| | Recording configuration | Enable | Checked or not | Enabling of the record or not upon change of state of this variable in the event log |
| | | Upon any change of state (TSD) or upon active (TSS) | Checked or not | Saving of the event upon any change of state of the variable (TSD) or upon appearance of the active state (TSS). |
| | | Upon loss of closing (TSD) or upon inactive (TSS) | Checked or not | Saving of the event upon disappearance of the closed state of the variable (TSD) or upon appearance of the inactive state (TSS). |
| | Alarm configuration | Enable | Checked or not | Enabling of the alarm or not upon change of state of this variable and saving in the alarm log. |
| | | Upon any change of state (TSD) or upon active (TSS) | Checked or not | Activation of the alarm and saving of alarm upon any change of state of the variable (TSD) or upon appearance of the active state (TSS) |
| | | Upon loss of closing (TSD) or upon inactive (TSS) | Checked or not | Activation of the alarm and saving of alarm upon disappearance of the closed state of the variable (TSD) or upon appearance of the inactive state (TSS). |
| | | Alarm level | Scada + sms Scada sms | Several possible actions in the event of a retransmission of alarm depending on the defined level. |
| | | Time-delayed alarm | Checked or not | Activates a time delay before sending the alarm. |
| | | Delay value | 0 to 99 | Number of hours, minutes or seconds for the delay before sending the alarm to the SCADA |
| | | Hours or Minutes or Seconds | Checked according to choice | Choice of unit for the value of the alarm delay |
| | | Save | | Allows the configuration to be taken into account |
| | | Cancel | | Enables return to the preceding configuration |

| Page: Settings | | | | |
|---|-------------------------|--------------------------|---|--|
| Sub-page | Section | Parameter / button | Configuration range | Comments |
| Variable configuration Measurement configuration | General parameters | Variable name | No restriction | Name given to variable. |
| | | Correction coefficient | Direct or raw or Direct/10 to direct/10000 or Direct*10 to direct*10000 | Definition of a coefficient of multiplication to be applied to the measurement variable for its correct display in the monitoring page. Allows display in the correct format relative to the real size By default for T200 series 3: current = direct/10 and voltage = direct By default for T200 series 1 or 2 or L500 compatibility: current = direct and voltage = direct*100 |
| | | Logical address | | TM internal No. assigned automatically by the T200 (unmodifiable). |
| | | Class | (Complete list of all classes) | Allows a variable to be assigned to an existing class. |
| | | Access | Administrator Operator Monitoring | Access right for this variable. The variable will be readable or modifiable depending on the type of access configured and the associated access rights. |
| | | Internal address | | Address for the COM-CPU internal Modbus link (unmodifiable). |
| | | External address (SCADA) | Format 'x' (e.g. 2) | External address used by SCADA for this variable |
| | | Unit | No restriction | Unit for display of the variable |
| | | Max. value | Integer | Maximum value that can be taken in practice by the measurement value. NB: The value configured influences the precision of the measurement. |
| | | Min. value | Integer | Minimum value that can be taken in practice by the measurement value. NB: The value configured influences the precision of the measurement. |
| | Regular processing | Recording | Checked or not | Enabling of regular saving of the measurement in the measurement log or not. |
| | | Period | 15 min., 30 min. or 1 h | Measurement recording period |
| | | Type | Averaged or sampled | Way of calculating the measurement for recording in the measurements log |
| | | Event | Checked or not | Enabling of regular saving of the measurement in the protocol event stack or not. |
| | | Call | Checked or not | Enabling of regular sending of the alarm to SCADA and saving in the alarm log or not. |
| | Processing on threshold | Period | 15 min., 30 min. or 1 h | Event or call saving period. |
| | | Recording | Checked or not | Enabling of saving of the measurement in the measurements log or not upon exceeding threshold |
| | | Event | Checked or not | Enabling of saving or not upon exceeding the measurement threshold in the protocol event stack. |
| | | Call | Checked or not | Enabling of sending of the alarm to SCADA and saving in the alarm log or not upon exceeding threshold. |
| | | High threshold | Checked or not | Enabling of high threshold or not |
| | Dead band | Low threshold | Checked or not | Enabling of low threshold or not |
| | | High threshold value | No restriction | Value for enabling exceeding of the high measurement threshold |
| | | Low threshold value | No restriction | Value for enabling exceeding of the low measurement threshold |
| | | Recording | Checked or not | Enabling of recording of the measurement in the measurements log or not through variation |
| | | Event | Checked or not | Enabling of regular saving or not upon variation of the measurement in the protocol event stack. |
| | Min. and Max. recording | Call | Checked or not | Enabling of sending of the alarm to SCADA and saving in the alarm log or not following measurement variation. |
| | | Value as % | 0 to 255 | % variation of the measurement for the dead band criterion. |
| | | Active maximum | Checked or not | Recording or not of the maximum measurement reached over the period configured |
| | | Active minimum | Checked or not | Recording or not of the minimum measurement reached over the period configured. |
| | | Period | 1, 7 or 14 days | Calculation period for min. and max. value |
| | Class management | Save | | Allows the configuration to be taken into account |
| | | Cancel | | Enables return to the preceding configuration |
| | | Recycle bin | Checked or not | Selection of class to be deleted or not |
| | | Monitoring | Checked or not | Selection or not of class display in the Monitoring page |
| | | Class name | No restriction | Class name to be displayed |
| | | Save | | Allows a modification or a creation to be recorded for each class |
| | | Delete | | Allows a class that has been selected earlier to be deleted |

8 Appendix B - General characteristics

| Power supply | | |
|-------------------------|--|---|
| AC supply | Characteristics | 230 Vac - 50 Hz, 120 VA Protected by HRC fuse of 4 A rating, type gF Permissible mains voltage: 90 V to 270 Vac (43 V and 57 V on option). |
| | Charger | 12 V / 7 A |
| Power supply | Rack power supply | 12 Vdc (10.8 V to 14.8 V). Protected by a 0.8 A fuse |
| | Telecommunications | 12 Vdc (10.8 V to 14.8 V) max. 1 A Protection if consumption > 1.3 A for more than 3 min. |
| | 48 V or 24 V motorization | 48 Vdc (44.8 V to 59 V) max. 6 A for 12 s and 15 A, 500 ms Protected by 5-A fuse. Permanent consumption tolerated on 48 V for auxiliary equipment: 90 mA |
| Battery | Type | Sealed lead maintenance-free type |
| | Charging time | 10 h to 24 h |
| | Charger capacity | 12 Vdc - 24 Ah |
| | Battery life from -15°C to +55°C | Up to 16 h + 10 open/close (O/F) cycles |
| | Monitoring | Total discharge, periodic tests |
| | Lifetime at 20°C | 10 years |
| Characteristics | | |
| Input/output capacity | Telecontrols (TCD) | 1 to 4 channels (8- to 16-channel option) Opening/closing orders controlled by +V (or 0V) polarity for a duration of 3 s, with fuse-protected outputs. |
| | Double telesignals (TSD) | As for TCD. Indication of open/closed positions, "Locked" (earthing switch). |
| | Indication inputs | 6 digital inputs per Control module, controlled by 0V polarity. |
| Dielectric | AC supply input | Insulation (50 Hz/1 min.): 10 kV Surge (1.2/50 µs): 20 kV |
| | Toroid input | Insulation (50 Hz/1 min.): 2 kV Surge (1.2/50 µs): 5 kV |
| Electromagnetic | Rapid transients | IEC 61 000-4-4 Level 4 : 2,5 kV (common mode), 1 kV (differential mode) |
| | Electrostatic discharges | IEC 61 000-4-2 Level 4 ; 8 kV contact |
| | Radiated electromagnetic field | IEC 61 000-4-3 80 MHz – 1 GHz – 10 V/m |
| | Radio frequency on FSM | IEC 61 000-4-6 0,15 MHz à 80 MHz – 10 Vac |
| | 50 Hz magnetic fields | IEC 61 000-4-8 30 A/m continuous and 300 A/m 1 to 3 s |
| Climatique | Temperature | - 15 °C to + 55 °C |
| | Relative humidity | IEC 60 68-2-3 Less then 95 % at 40 °C |
| | Salt spray test | IEC 60 68-2-11 96 h |
| | Storage temperature | IEC 60 68-2-14 - 25 °C à + 70 °C |
| Mechanical | Enclosure material | 10 to 500 Hz ; 1 g or 0,30 mn peak à peak |
| | Vibrations | IEC 60 68-2-6 10 to 500 Hz ; 1 g or 0,30 mn peak à peak |
| | Dimensions (T200I 2 voies) | H x W x D 670 mm x 310 mm x 335 mm |
| | Weight | 50 kg |
| | Protection | IEC 60 529 IP33 |
| Options | | |
| Internal fault detector | Capacity | 4 per T200 Control module |
| | Type | Constant time current sensor |
| | Phase-to-phase fault threshold | 100 to 750 A |
| Current | Earth fault threshold | Configurable from 20 to 160 A or 5 to 20 A |
| | Fault duration | 50 to 500 ms |
| | Reset | By voltage return, by time delay or via an external loop |
| Voltage | Phase current measurement | Yes |
| | Type | Single-phase or three-phase |
| | Power off threshold | 20% to 95% of rated voltage |
| Measurement accuracy | Residual voltage threshold | 5% to 50% of rated voltage |
| | Mains voltage measurement | Yes |
| | I and U measurement | 3 % |
| | Fault detector | 3 % |
| External fault detector | Capacity | 4 per T200 Control module |
| SEC function | Opens after a failed reset | Opens in the first or second slow reset voltage dip |
| ACO function | Source changeover switch | Configurable delay time and return time |
| BTA function | Source changeover switch with coupling | Configurable delay time, return time and time for locking upon voltage loss. |
| GPS (option) | Time synchronization by satellites | Accuracy of time setting: 5 ms on average, 50 ms max. |
| SNTP (option)p | Time synchronization by Internet | Accuracy of time setting: 1 second on average. |
| Cubicle connection | Type of connection | Polarized connectors. |

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*As standards, specifications and designs change from time to time,
please ask for confirmation of the information given in this publication.*